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Navn:	Mikkel Kousgaard Rasmussen og Herman Frimann Koren

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The relationship between earnings yield, size, and stock returns across capital markets of different sizes

Mikkel Kousgaard Rasmussen & Herman Frimann Koren

Supervisor: Isaiah Hull

Master Thesis in MSc in Finance

BI Norwegian Business School

Abstract

We study the relationship between earnings yield, size, and stock returns across capital markets of different sizes. Using data from 2002-2022, we group index constituents of the SPX, ASX, NIKKEI 225, HEX, and OSEAX into five portfolios based on earnings yield and market value. We also randomize the portfolios to check for robustness. We proceed to compare the risk-return relationships across the different indices based on absolute and risk-adjusted returns. We successfully map an earnings yield effect in four of the five countries and a size effect in all five countries. However, we cannot conclude the presence of a clear difference in the relationship between small and large capital markets, at least over the entire 2002-2022 period. This suggests that the lower efficiency characterizing smaller capital markets is not reflected in factor premiums.

Preface

This thesis marks the end of our time at BI Norwegian Business School. While we have thoroughly enjoyed writing this thesis, we have developed a profound respect for the effort it requires to produce and interpret reliable results.

We would like to extend our appreciation to our supervisor, Isaiah Hull, for his thorough feedback and guidance throughout the process of writing this thesis.

Oslo, 13.05.2023

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List of abbreviations

E/P (EP):	Earnings yield
P/E (PE):	Price-to-earnings
EPS:	Earnings per share
M/V (MV)	Market value / market capitalization
LTM:	Last-twelve-months
EMH:	Efficient Market Hypothesis
CAPM:	Capital Asset Pricing Model
SPX:	S&P 500 index (US)
ASX:	FTSE all-share index (UK)
NIKKEI 225:	Nikkei 225 index (Japan)
HEX:	Helsinki Stock Exchange all-share index (Finland)
OSEAX:	Oslo Stock Exchange all-share index (Norway)
BM:	Benchmark
Rf:	Risk-free rate

1.0 Introduction and motivation

The higher (lower) returns of stocks with high (low) earnings yield and small (high) market values were first documented in the US in the late seventies and early eighties by Basu (1977 & 1982), Reinganum (1981), Banz (1980), and others.

Newer studies, however, suggest a diminishing presence of the earnings yield and size effects after the papers first highlighting the asset pricing anomalies were published (Schwert, 2002), and it is likely a result of ever-more integrated markets and trading activity (Chordia et al., 2012).

As we also highlight in our literature review in a later section, Basu's 1982 paper (1982) and the majority of the most frequently cited literature in the past have predominantly focused on the US and other large capital markets. However, one may suspect that the earnings yield and size effects could still be present in smaller capital market that are less efficient (Kennedy, 2004), and thus could be more prone to asset pricing anomalies. At least, Næs (2009) and Grimeland (2018) document the presence of the size effect in Norway in recent decades.

However, we have not been able to identify any past papers that investigate potential differences in the relationship between earnings yield, size, and stock returns in countries with capital markets of different sizes in one single paper, as most papers have focused on either large or small capital markets separately. As such, detecting whether there is a difference in the relationship across capital market sizes requires a comparison of various individual papers. Unfortunately, this makes one-to-one comparisons less feasible due to potentially different methodologies and time periods applied in the various papers.

The relationship across capital markets of different sizes thus appears understudied, leaving an important gap to fill. This leaves us with the motivation to investigate this relationship. To empirically test this, we use indices from three countries with large capital markets, namely the US, the UK, and Japan, and indices from two countries with small capital markets, namely Finland and Norway, in the period 2002-2022.

We make use of the original methodology of Basu (1982) when creating earnings yield and market value portfolios, generating five portfolios sorted on earnings yield and five portfolios sorted on market values. To check the robustness of our findings, we also generate five portfolios based on randomized earnings yields and five portfolios based on randomized market values. In evaluating the performance of the portfolios, we look at four different metrics: average absolute returns (which we also test for statistically), risk-adjusted returns, alphas, and indexed returns.

The 2002-2022 period is characterized by major events, such as a general upswing in stock prices, the financial crisis of 2008, and the emergence of COVID-19. We thus also believe it is worthwhile to test whether there are any noticeable differences in the relationship between earnings yield, size, and stock returns in capital markets of different sizes over time. We do this by splitting the 2002-2022 sample into two: 2002-2012 and 2012-2022, providing us with roughly the same number of observations in each.

From our analysis, we are able to map the presence of significant earnings yield and size effects. Starting with earnings yield, we identify a visible pattern of higher absolute and risk-adjusted returns of high earnings yield portfolios relative to low earnings yield portfolios in all countries except Japan. The robustness check from randomizing the earnings yield portfolios, however, indicates a slightly less clear relationship. We also split the 2002-2022 sample period into two, namely 2002-2012 and 2012-2022, to map out any potential differences in the earnings yield effect over time. In the former period, we identify a clear outperformance of the highest earnings yield portfolios on both an absolute and risk-adjusted basis across all countries except Japan. In the latter period, the relative outperformance of the highest earnings yield portfolios disappears in all countries except Finland. The results in both periods also hold when randomizing the portfolios on earnings yield.

Moving on to size, we identify higher absolute and risk-adjusted returns of the lowest market value portfolios in all five countries. Despite bringing much higher volatility, the lower market value portfolios compensate with significantly higher returns. We broadly arrive at the same conclusions when checking for robustness by randomizing the market value portfolios. However, the outperformance of small market value portfolios appears stronger in the smaller capital markets of Finland and Norway compared to the larger capital markets. When splitting the sample period into the

2002-2012 and 2012-2022 periods, the size effect appears much stronger in the former period and less strong in the latter. When randomizing on size, we identify a clear outperformance in all countries except the UK in the former period, while the outperformance in the latter period is dominated by the smaller capital markets.

Based on our findings, we conclude that there, despite the presence of significant earnings yield and size effects, exist no clear differences in the relationship between earnings yield, size, and stock returns between small and large capital markets. This conclusion holds for at least the entire 2002-2022 period, although we do identify some more visible patterns when splitting the sample. However, overall, this suggests that the lower efficiency characterizing smaller capital markets (Kennedy, 2004) is not reflected in factor premiums. In a practical setting, this implies that an investor cannot expect to earn higher risk-adjusted returns from investing in the earnings yield and size factors in small capital markets relative to large capital markets.

2.0 Theoretical background

The purpose of this section is to give the reader an overview of the theory most central to the empirical tests we will perform in a later section. The section encompasses an introduction to asset pricing theory, definitions of the concepts of growth and value stocks, and a short presentation and potential explanations of the value and size premiums documented in the past literature. It will finally end with a brief outline of the differences between capital markets of different sizes.

2.1 A brief introduction to asset pricing

2.1.1 The Efficient Market Hypothesis ("EMH")

The Efficient Market Hypothesis ("EMH") is a theory extensively used within the field of finance. According to Fama (1969), an efficient market is "one in which stocks fully reflect all available information", implying that all existing information is already reflected in the stock price today. As such, only new information will change the stock price.

The EMH has three forms: 1) the weak form, implying that stock prices reflect all historical data, 2) the semi-strong form, which suggests that all publicly available information is reflected in stock prices, and 3) the strong form, which entails that all information, including insider information, is reflected in stock prices (Bodie et al., 2021).

However, the EMH also relies on a set of assumptions that may be considered unrealistic. For instance, it assumes that all investors are rational, i.e. that they are not swayed by their emotions or biases. It also assumes no information asymmetry, transaction costs, or other microstructure issues. In addition, and perhaps most importantly, it assumes that all securities are priced efficiently at all times to reflect available information (Bodie et al., 2021). A fully efficient market implies that it will be impossible for market participants to outperform their benchmarks in the long run.

The practice of testing for market efficiency is a joint test of the asset pricing model, according to Fama (1969). As such, whenever one concludes that an empirical result suggests the presence of market inefficiency, it may instead be evidence that the underlying asset pricing model, e.g. the capital asset pricing model ("CAPM"), is inadequate. Asset pricing models are thus next in line to be defined and discussed.

2.1.2 The Capital Asset Pricing Model ("CAPM")

The first proper foundations for how to think about expected returns were laid by Sharpe (1964), Lintner (1965), and Black (1972). Their CAPM framework suggests that the expected returns of stocks are a positive linear function of their systematic risk, i.e. their market betas:

$$R_{it} - R_{ft} = \propto_i + \beta_i(R_{mt} - R_{ft}) + \varepsilon_{it} \qquad (2.1.2)$$

However, while the CAPM framework is widely used by practitioners today, the accuracy of the theoretical framework has long been denied. This is largely due to the several unrealistic assumptions underlying the model. One such key assumption is that only systematic risk matters for a stock's risk premium. As such, it ignores all potential company-specific and macroeconomic risk factors.

2.1.3 Multi-factor asset pricing models

Several papers since the emergence of the CAPM have documented its flaws. It has, for instance, been documented that size (Banz, 1980) and the value measures earnings yield (Basu, 1977 & 1982) and book-to-market ratio (Rosenberg et al., 1985) also matter. This indicates that the simple risk-return relationship between market risk and the returns of individual stocks suggested by the CAPM does not hold, resulting in the rise of multi-factor asset pricing models. The most commonly known of these is perhaps Fama and French's three-factor-model (1992):

$$R_{it} - R_{ft} = \propto_i + \beta_i(R_{mt} - R_{ft}) + s_i SMB_t + h_i HML_t + \varepsilon_{it} \qquad (2.1.3)$$

In this equation, SMB represents the difference between the returns of small and large stocks, while HML represents the difference in returns of stocks with high and low book-to-market ratios. The latter is known as the value factor. In this paper, however, we use earnings yield as our definition of the value factor.

2.2 Growth and value stocks

2.2.1 Growth stocks

Growth stocks are stocks that usually trade at low (high) E/P multiples (P/E multiples), causing them to look expensive at first glance. However, the high multiples imply expectations of stronger growth relative to the market and expectations of higher earnings in the future. As such, investors are willing to pay more per dollar of earnings. Stronger growth than expected by the market should lead to an appreciation of the share price, while lower growth than anticipated should materialize into a lower share price (Corporate Finance Institute, 2023).

2.2.2 Value stocks

On the contrary, value stocks can be defined as stocks with high (low) E/P multiples (P/E multiples). These stocks usually pay dividends and are priced below their fundamental values. As such, the abnormal return of value stocks comes from the share price appreciation when the stock eventually catches up with its fundamental value (Corporate Finance Institute, 2023).

2.3 The value and size premiums

The value and size premiums were two of the first asset pricing anomalies (i.e. something that deviates from what is normal) detected, with the former being documented first by Basu (1977) and the latter by Banz (1980). Before diving into potential explanations of the value and size premiums, it is worthwhile to first define what we mean by the value and size premiums.

2.3.1 Definition of the value premium

There exist a number of different definitions of the value factor. In multi-factor asset pricing models, it is most commonly referred to as “HML” (high-minus-low), i.e. the returns on high book-to-market stocks minus the returns on low book-to-market stocks. However, we make use of earnings yield in this paper. Denoted E/P, i.e. the inverse of the more commonly used P/E ratio, earnings yield is the ratio of net income to market capitalization, or equivalently earnings per share (“EPS”) to the share price. In this paper, we specifically refer to it as the last-twelve-month (“LTM”) EPS divided by the share price.

2.3.2 Definition of the size premium

The size of a company can be defined in various ways, such as revenues, number of employees, book value of equity, market capitalization, enterprise value, and many more. In this paper, we make use of market capitalization, as the net income defined above accrues to shareholders only if we exclude minorities. Market capitalization

("MV") is computed as the shares outstanding multiplied by the share price. We do not use the diluted share count due to differences in the types of dilutive securities, vesting and exercise periods, and the likelihood of exercise.

2.3.3 Explanations of the value and size premiums

According to the strongest form of market efficiency, arbitrage opportunities (i.e. risk-less profits) should not exist. Even in the milder versions of the market efficiency theory, we should expect arbitrage opportunities to vanish almost instantly from investors exploiting the pricing mismatches. However, while the economic significance of arbitrage has decreased in the past decades due to increasingly integrated markets with an ever-increasing flow of information, they still exist (Chordia et al., 2012). Below we list several key explanations behind the persistence of the value and size premiums.

Expectations often fail to materialize (the value premium)

An explanation behind the outperformance of value stocks (i.e. high earnings yield) relative to growth stocks, for instance documented by Basu (1977 & 1982), is the fact that investors tend to have too optimistic expectations for the performance of growth companies (e.g. extrapolating the strong growth in the past into the future), while they have too pessimistic expectations for value companies (Berkin & Swedroe, 2016). This results in a situation where growth stocks are persistently overpriced – and vice versa for value stocks. Another explanation may also be that investors tend to be more familiar with popular growth stocks, thus adding to the demand for such stocks.

Earnings and cash flows of value companies are typically riskier (the value premium)

Further, academic papers have found that the earnings and profitability quality of value companies are poorer than those of growth companies (Chen & Zhang, 1998). A 2005 study (Zhang, 2005) concluded that the higher returns of value stocks result from them being much riskier in times of economic uncertainty and turmoil, thus requiring higher premiums, while they are only moderately less risky than growth stocks in good economic times.

Smaller companies are typically riskier (the size premium)

The size premium first documented by Banz (1980) can be explained by the fact that smaller companies are typically riskier due to several factors: they usually have greater leverage, a smaller capital base, have higher volatility of earnings and cash flows, have less liquidity, and have a less proven or even unproven business model (Berkin & Swedroe, 2016).

In addition, investors tend to prefer lottery stocks (Berkin & Swedroe, 2016), which refer to stocks where the chance of huge payoffs exists (this is often associated with smaller companies that are yet to be fully "discovered" by the market). Investors tend to deem this attractive despite the elevated downside probability.

Constraints to short-selling (both the value and size premiums)

Short-selling entails borrowing a financial security and then selling it on the market in the hopes of buying it back at a lower price in the future, thus realizing a profit (net of interest costs etc.). Short-selling is thus an important instrument in the exploitation of arbitrage opportunities. However, there are several limits to arbitrage, thereby often resulting in the inability of the price equilibrium to be restored (Berkin & Swedroe, 2016): 1) Institutional investors may be prohibited from taking short-positions from their charters, 2) investors may be unwilling to take on the risk of short-selling due to unlimited downside, 3) the interest costs associated with shorting a stock can be high, and there may also be a limited supply of stocks available to borrow, which may particularly be the case for smaller growth stocks, 4) the borrowed stocks may be recalled before the strategy turns positive, and the short-sellers also run the risk of getting their position liquidated early due to poor short-term performance of the short-position.

2.4 Differences between small and large capital markets

Central in this paper are the potential differences in the relationship between earnings yield, size, and stock returns in capital markets of different sizes. The main difference between smaller and larger capital markets relates to market efficiency (Kennedy, 2004). This […consists of three different, yet interrelated aspects: efficiency in allocating capital and risks, efficiency in market operations, and efficiency in transmitting information…] (Kennedy, 2004). The size of a capital market is important, as larger capital markets are better able to leverage economies of scale. As such, while the size of a capital market does not make it more efficient, it can contribute to efficiency through higher liquidity and diversity of financial securities and instruments. This suggests that the earnings yield and size premiums (and potentially many other factors as well) should, all else equal, be more evident in smaller capital markets and less so in larger capital markets.

3.0 Literature review

Past literature has detected several anomalies related to the pricing of stocks, including those related to value and size. As such, this postulates that either is the one-period CAPM framework misspecified, or else is the market not fully efficient. This section will elaborate more on past literature to set the tone for our analysis and presentation of empirical results in a later section. It will start by outlining the earliest work on the size and value premiums, focusing primarily on the US, after which we proceed to see if the premiums have disappeared since they were first detected. Following that, we discover past literature on the topic from countries with smaller capital markets.

3.1 Early work on the size and value premiums

As mentioned in a previous section, the size factor encapsulates the difference in returns between stocks of companies of different sizes. According to Banz (1980), stocks of smaller companies, on average, produce higher risk-adjusted returns than those of larger companies. This indicates the presence of a size premium, which Banz documents to be statistically significant for at least forty years from 1936-1977. Worth noting is also his findings that the size premium is strongest for the very smallest companies, while there is only a small difference in returns between average-sized and large-sized companies, suggesting that the size effect is not linear.

Travelling a couple of years back in time, Basu (1977) aims to empirically determine whether stock returns are related to their P/E ratios (i.e. the inverse of the E/P ratio we focus on in this paper). Specifically, he aims to investigate whether stocks with low P/E ratios (i.e. value stocks) produce higher risk-adjusted returns compared to stocks with higher P/E ratios (i.e. growth stocks). Indeed, Basu finds that portfolios of low P/E stocks have, on average, earned higher absolute and risk-adjusted returns compared to the portfolios consisting of stocks with high P/E ratios. Basu receives support from Reinganum (1981), who also finds a significant earnings yield effect. However, Reinganum's findings also show that the earnings yield effect does not emerge after controlling for size, suggesting that the size effect largely subsumes the value effect.

In an attempt to confirm his previously established relationship, Basu (1982) re-examines and checks the robustness of his previous findings. His findings confirm the results from his 1977 paper. Perhaps most importantly, his findings are also clearly significant when adjusting for size. Contrary to Reinganum, Basu's 1982 paper thus claims that the value effect subsumes the size effect.

However, neither of the findings from Reinganum (1981) and Basu (1982) are consistent with the findings from Cook and Rozeff (1984), who claim that nothing suggests that one effect subsumes the other. Instead, the authors indicate that both the value and size effects are at work, while they also open up for the possibility that the two effects measure separate elements of a single underlying effect.

Moving to the 1990s, when testing the joint roles of several fundamental asset pricing factors, Fama and French (1992) find strong univariate relationships between returns and size, leverage, earnings yield, and book-to-market ratio. However, in multivariate tests, the authors find that the combination of size and book-to-market ratio absorbs the roles of leverage and earnings yield, at least during the 1963-1990 sample period used in their paper.

3.2 Diminishing significance of the value and size premiums

Despite being well-documented in the past literature, more recent research has suggested a significant reduction in asset pricing anomalies, including the value and size premiums, thus suggesting more efficient markets. Schwert (2002) finds that many well-known anomalies do not hold up in different sample periods. He notes that particularly the value and size premiums have disappeared after the papers highlighting them were published.

With the ever-increasing amount of published research, driving higher market efficiency as investors become aware of the asset pricing anomalies, a 2012 study (Chordia et al., 2012) provides further support for the claim above. Chordia investigates whether capital market anomalies have been reduced or eliminated through the stimulation of greater anomaly-based arbitrage in light of the significant increase in liquidity and trading activity.

Having studied anomalies in a sample period spanning over three decades, his findings suggest that the various asset pricing anomalies' economic and statistical significance have indeed decreased.

3.3 Premiums may still exist in smaller capital markets

The first and most cited papers concerning asset pricing anomalies have focused on the largest capital markets, primarily the US, where a diminishing presence of asset pricing anomalies has been documented. However, the question is whether this trend is similar for smaller capital markets that receive less attention compared to the largest capital markets. While literature on the Nordic stock markets exist, they have been cited significantly less.

A working paper from Norges Bank (Næs et al., 2009) looks at what factors affect the Oslo Stock Exchange from 1980-2006. While they, perhaps surprisingly, find little empirical support for the oil price driving stock returns, they find that firm size and liquidity seem to be demanding risk compensation, while book-to-market (i.e. value) and momentum do not seem relevant in the Norwegian setting. The fact that the size effect is still present in Norway is also supported by Grimeland (2018), who uses a sample from 1997-2017. Similarly to Næs (2009), Grimeland finds little evidence of a value effect in the Norwegian stock market.

As mentioned before, we have been unable to find a paper that specifically investigates the presence of the value and size premiums in both the largest and a number of smaller capital markets, hence why our paper contributes to and complements existing literature.

4.0 Hypothesis

With the theoretical framework and past literature in mind, we have established two primary hypotheses for testing the relationship between earnings yield, size, and returns across capital markets of different sizes.

Hypothesis 1:

> ***Null hypothesis:*** *There exist no significant differences in the relationship between earnings yield, size, and stock returns across capital markets of different sizes from 2002-2022.*
>
> ***Alternative hypothesis:*** *There exist significant differences in the relationship between earnings yield, size, and stock returns across capital markets of different sizes from 2002-2022.*

We will test this hypothesis in a four-stage process (we explain the specific methodology, including data collection and portfolio creation, in the methodology section below in section 5.0). The first part of the hypothesis concerns the relationship between earnings yield and stock returns. Hence, the process will start by investigating whether portfolios consisting of index constituents with high earnings yields produce higher absolute and risk-adjusted returns than those portfolios with the lowest earnings yields in the five countries. It will then move to the second part of the hypothesis, namely the relationship between size and stock returns. Here, we will investigate whether portfolios consisting of index constituents with low market values produce higher absolute and risk-adjusted returns than those portfolios with the highest market values. We then check for robustness of the findings by repeating the process but using randomized earnings yield and randomized market value portfolios. The portfolios will be evaluated based on four parameters: absolute returns (which we also test for statistically), risk-adjusted returns, alphas, and indexed returns.

Hypothesis 2:

> **_Null hypothesis:_** *There exist no significant differences in the relationship between earnings yield, size, and average stock returns in different periods within the 2002-2022 period.*
>
> **_Alternative hypothesis:_** *There exist significant differences in the relationship between earnings yield, size, and average stock returns in different periods within the 2002-2022 period.*

Building on the framework from *Hypothesis 1*, we will investigate the relationship between the variables in two different periods by simply evaluating and testing for the significance of the absolute and risk-adjusted portfolios we created above but with respect to the two periods. As such, we will perform no inter-country tests.

5.0 Methodology

Building on the hypotheses established in section 4.0, this section will explain our choice of methodology. It will first explain our choice of data before it moves on to explain how we build portfolios. Lastly, it will highlight the parameters we use to evaluate the performance of the portfolios.

5.1 Data collection

We extract the necessary data to test our hypotheses from Bloomberg. The pool of companies we examine comprises those featured in the SPX index (US), ASX (UK), Nikkei 225 (Japan), HEX (Finland), and OSEAX (Norway) in the period 2002-2022. In line with our hypotheses, we group the US, the UK, and Japan as belonging to a group of countries with large capital markets, while we group Finland and Norway as belonging to a group of countries with small capital markets. We prefer to use the largest indices possible in the selected countries to avoid too many missing data points. This because especially the earlier years of the sample period have a higher frequency of missing data. Moreover, we do not exclude companies with missing data points, as they generally only constitute an insignificant part of our sample, thereby not biasing our empirical results.

Specifically, we collect earnings yields and market values from April 2002 to March 2022. We define earnings yield as the last-twelve-months (LTM) earnings per share (EPS) divided by the share price at the end of the year, whereas we compute market values as the current outstanding shares (not fully dilutive) multiplied by the share price.

We also collect monthly share prices in order to compute returns. To qualify for inclusion in our sample, a stock must have been listed on the first trading day of the year, in addition to having traded throughout the entire first month of the year.

5.2 Portfolio creation

When constructing portfolios, we use the original methodology of Basu (1982) without any modifications.

To test the relationship between earnings yield, size, and stock returns, we first rank the index constituents' earnings yield (market value) in ascending order. We then form five portfolios, where EP1 (MV1) has the lowest earnings yield (market value) and EP5 (MV5) the highest, while simultaneously belonging to different classes of market values (earnings yield). This procedure is done every twelve months over the span of our data from 2002-2022. The portfolio constituents are weighted equally.

To provide further strength to our empirical analysis, we, similarly to Basu (1982), also conduct a randomized test of earnings yield and size to determine whether the results we get from the non-randomized tests are robust. To build the randomized earnings yield (market value) portfolios, we first rank the index constituents by their earnings yields (market values) within each of the market value (earnings yield) portfolios from 2002-2022. We then assign the index constituents to one of the five earnings yield (market value) sub-portfolios based on the quintiles from the distribution. The highest (lowest) earnings yield (market value) sub-portfolios are combined to form the EP5* (MV1*) portfolio, while the other sub-portfolios are combined to form EP1*, EP2*, EP3*, and EP4* (MV5*, MV4*, MV3*, and MV2*). This process is repeated every year at the beginning of April, thus resulting in changes to the composition of the portfolios every year. The randomized portfolio constituents are also weighted equally.

To evaluate if the relationship between earnings yield, size, and stock returns has changed over time in the 2002-2022 period, i.e. *Hypothesis 2*, we split our sample period into two: From April 2002 to March 2012 and from April 2012 to March 2022. As opposed to splitting the two periods based on a key financial event, such as the financial crisis of 2008, we instead split the sample to have roughly the same number of observations.

5.3 Evaluating portfolio performance

To evaluate the performance of the different portfolios, we look at four different metrics: 1) average absolute returns, computed by taking the arithmetic average of the monthly returns over the course of the sample period. We also test for the statistical significance of the outperformance by the high earnings yield and low market value portfolios using a one-sided t-test for differences in the mean absolute returns using a significance level of 5%. 2) the portfolios' Sharpe ratios, computed using the average absolute returns and average standard deviations of the return series and the respective risk-free rates, 3) the portfolios' alphas, computed using the CAPM framework, and 4) using indexed returns, thereby showing which portfolios have yielded the highest returns had one invested in 2002 and held the positions throughout the entire period.

6.0 Empirical findings

Having established the theoretical framework and past literature, this section proceeds to test each of our two hypotheses. As a majority of the most cited literature in the past concerns the US, this section will start with a discussion of our empirical findings from the country from 2002-2022. Immediately following this, the section will proceed to uncover differences in the magnitude and presence of the earnings yield and size effects between capital markets of different sizes, in line with *Hypothesis 1*. As proposed in *Hypothesis 2*, the final section will present and discuss any noticeable differences over time within our 2002-2022 period.

6.1 Hypothesis 1: Differences in the earnings yield and size effects across capital markets of different sizes

6.1.1 Earnings yield and stock returns

Basu (1977 & 1982) found that portfolios of high earnings yield stocks have, on average, earned higher absolute and risk-adjusted returns compared to those with low earnings yields.

Table 6.1 below shows that EP5 yields the highest absolute return with an annualized average return of 10.64%, while EP1 produces the lowest return of 9.10%, thus confirming Basu's findings about average absolute returns. The same conclusion, however, does not hold when looking at risk-adjusted returns. EP3 is not only producing by far the highest alpha of 2.52%, but it also stands out as the portfolio with the highest risk-adjusted return with a Sharpe ratio of 0.61. EP5, on the other hand, attains one of the lowest Sharpe ratios of 0.42. This is largely due to the portfolio's high volatility, albeit it is still higher than EP1's Sharpe ratio of 0.37.

Table 6.1: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of SPX earnings yield portfolios from 2002-2022

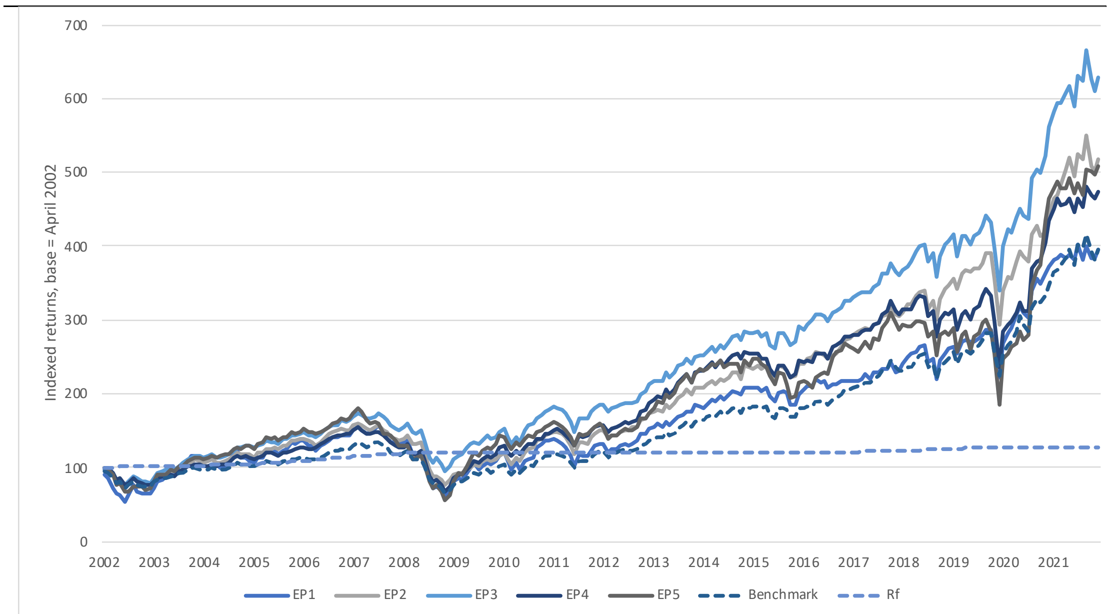
The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the earnings yield portfolios consisting of SPX constituents from 2002-2022. EP1 includes the constituents with the lowest earnings yields, while EP5 consists of the constituents with the highest earnings yields. BM is the abbreviation for benchmark index and refers to the SPX index, which we use as the benchmark index for the US.

		EP1	EP2	EP3	EP4	EP5	BM	Risk-free
US	Return	9.1023	9.4837	10.3470	9.2093	10.6356	7.9788	1.2214
	Std.	21.0841	15.6613	15.0046	16.7062	22.4465	14.7051	0.4437
	Sharpe	0.3738	0.5276	0.6082	0.4781	0.4194	0.4595	
	Alpha	-0.8947	1.4050	2.5236	0.7814	0.4791		

To visually illustrate the five earnings yield portfolios' performance from 2002-2022, we plot the five portfolios' absolute indexed returns together with the benchmark index and the risk-free rate in Exhibit 6.1. Again, EP3 stands out as the best-performing portfolio over most of the period.

Exhibit 6.1: Indexed returns of SPX earnings yield portfolios vs. benchmark index and risk-free rate from 2002-2022

The exhibit compares the indexed returns of the five different earnings yield portfolios made from the SPX constituents with the benchmark (SPX index for the US) and the risk-free rate. April 2002 is used as a base.



However, the higher absolute returns of the highest earnings yield portfolios may not necessarily be statistically significant. As such, we test for the statistical significance of the absolute returns of the earnings yield portfolios using a significance level of 5%. To accompany the possibility that the two “extreme” earnings yield portfolios (i.e. EP5 and EP1) may produce skewed results due to extreme outliers in the data (i.e. stocks with either extremely high or low earnings yields), we also test for the difference in EP4’s performance against EP2 and the benchmark index.

From Table 6.2 below, it becomes clear that we are unable to reject the hypothesis that portfolios consisting of stocks with higher earnings yield portfolios produce higher absolute average stock returns in the period 2002-2022 in the US. It also holds using a significance level of 10%. This result is in direct opposition with Basu (1977 & 1982) and Reinganum (1981) but in line with Schwert (2002) and Chordia (2012). However, it must be stressed that we have not tested for the value factor using other variables, such as book-to-market ratios (Rosenberg et al., 1985), thus suggesting that the value factor may still be significant through other variables.

Table 6.2: Hypothesis tests of SPX earnings yield portfolios from 2002-2022

The table presents the t-stats and critical values using a significance level of 5%. We reject the null hypothesis (the absolute returns of the highest earnings yield portfolios are not statistically higher than the absolute returns of the lowest earnings yield portfolios and the SPX benchmark index) if the t-stat is higher than the critical value. We reject the null hypothesis if the p-value is below the significance level.

		EP5 vs. EP1	EP4 vs. EP2	EP5 vs. BM	EP4 vs. BM
US	t-stat	0.5296	-0.1848	0.9759	0.9422
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.2984	0.4268	0.1650	0.1735
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null

Using the same methodology as in the case of the US above, we proceed to check for differences in the relationship between earnings yield and stock returns across countries with capital markets of different sizes. As also noted in section 5.1, we consider the US, the UK, and Japan as belonging to a group of countries with large capital markets, whereas we consider Finland and Norway to belong to a group of countries with small capital markets.

As shown in Table 6.3 below, EP5 yields the highest absolute stock returns in the US, UK, Finland, and Norway, while the EP1 portfolios in those countries yield (among) the lowest returns. The indexed absolute returns of the highest earnings yield portfolios versus the lowest earnings yield portfolios in the different countries presented in Exhibit 6.2 and 6.3 below showcase the same pattern, with the high earnings yield portfolios generally outperforming the low earnings yield portfolios. Regarding Japan, however, the result is the complete opposite. Here, EP1 yields the highest absolute return, while EP5 yields a return among the lowest.

When looking at risk-adjusted returns, only the UK and Finland find their EP5 portfolios yielding the highest risk-adjusted returns of the five portfolios. Nevertheless, these four countries' EP5 portfolios all have Sharpe ratios and alphas higher than EP1. In Japan, EP1 yields both the highest absolute and risk-adjusted returns. As such, while we are able to map the presence of an earnings yield premium in individual countries, we cannot establish any clear differences between small and large capital markets. Consequently, we cannot reject the null hypothesis of *Hypothesis 1*.

Table 6.3: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of earnings yield portfolios across countries from 2002-2022

The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the earnings yield portfolios from 2002-2022 across the five different countries. EP1 includes the constituents with the lowest earnings yields, while EP5 consists of the constituents with the highest earnings yields. BM is the abbreviation for benchmark index and refers to the SPX index for the US, ASX for the UK, NIKKEI 225 for Japan, HEX for Finland, and OSEAX for Norway. Data for Japan only covers the period from 2004-2022 due to a lack of data.

		EP1	EP2	EP3	EP4	EP5	BM	Risk-free
US	Return	9.1023	9.4837	10.3470	9.2093	10.6356	7.9788	1.2214
	Std.	21.0841	15.6613	15.0046	16.7062	22.4465	14.7051	0.4437
	Sharpe	0.3738	0.5276	0.6082	0.4781	0.4194	0.4595	
	Alpha	-0.8947	1.4050	2.5236	0.7814	0.4791		
UK	Return	5.1232	6.4859	5.4986	5.8399	8.6815	3.4245	1.9158
	Std.	21.1331	15.7040	15.2168	15.7022	20.0933	13.7242	0.5948
	Sharpe	0.1518	0.2910	0.2355	0.2499	0.3367	0.1099	
	Alpha	1.3867	3.0405	2.1332	2.4403	5.0568		
Japan	Return	9.5430	4.9911	6.1026	6.4959	5.5438	6.5644	0.1267
	Std.	22.2118	18.7502	19.1872	20.0893	22.2928	18.5517	0.0710
	Sharpe	0.4239	0.2594	0.3115	0.3170	0.2430	0.3470	
	Alpha	2.4445	-1.3135	-0.3565	-0.1162	-1.6228		
Finland	Return	5.5766	8.0567	7.8222	9.9579	11.8327	6.2585	1.0405
	Std.	22.9401	16.7844	17.1518	16.9149	17.3391	17.6774	0.4539
	Sharpe	0.1977	0.4180	0.3954	0.5272	0.6224	0.2952	
	Alpha	-0.6366	2.8536	2.4306	4.4236	6.4847		
Norway	Return	5.4700	8.3544	7.5055	10.1835	10.3087	12.3743	2.3054
	Std.	33.2440	24.5823	17.8149	16.0350	22.8431	18.8203	0.5072
	Sharpe	0.0952	0.2461	0.2919	0.4913	0.3504	0.5350	
	Alpha	-8.9535	-4.1548	-2.5880	0.8136	-1.8996		

Exhibit 6.2: Indexed returns of the highest earnings yield (EP5) portfolios from 2002-2022 across different countries

The exhibit compares the indexed returns of the highest earnings yield portfolios (EP5) across the five different countries. April 2002 is used as a base. Japan first starts from 2004 due to a lack of data.

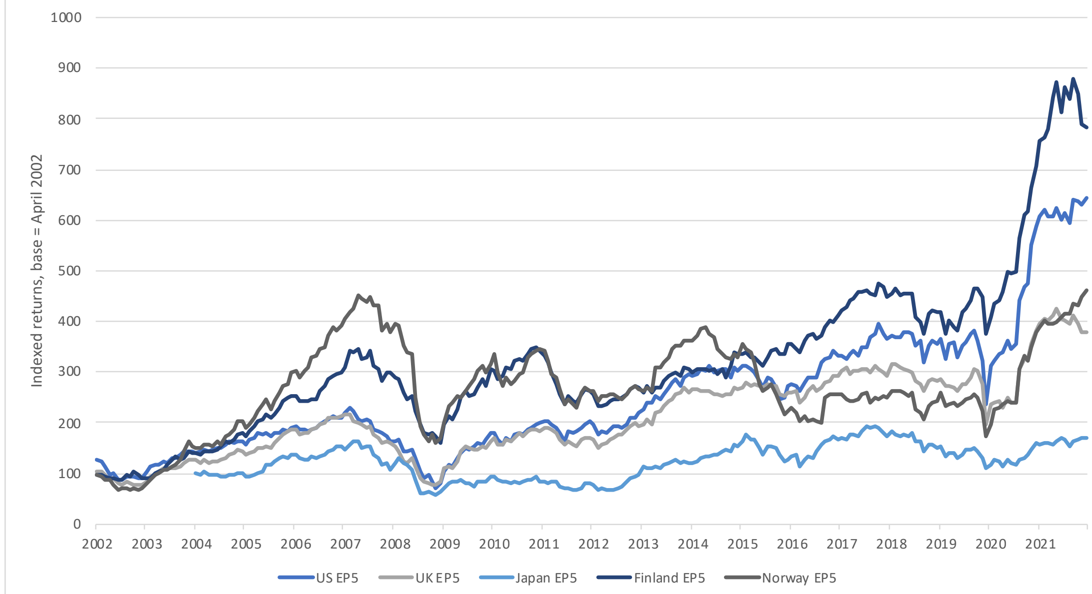
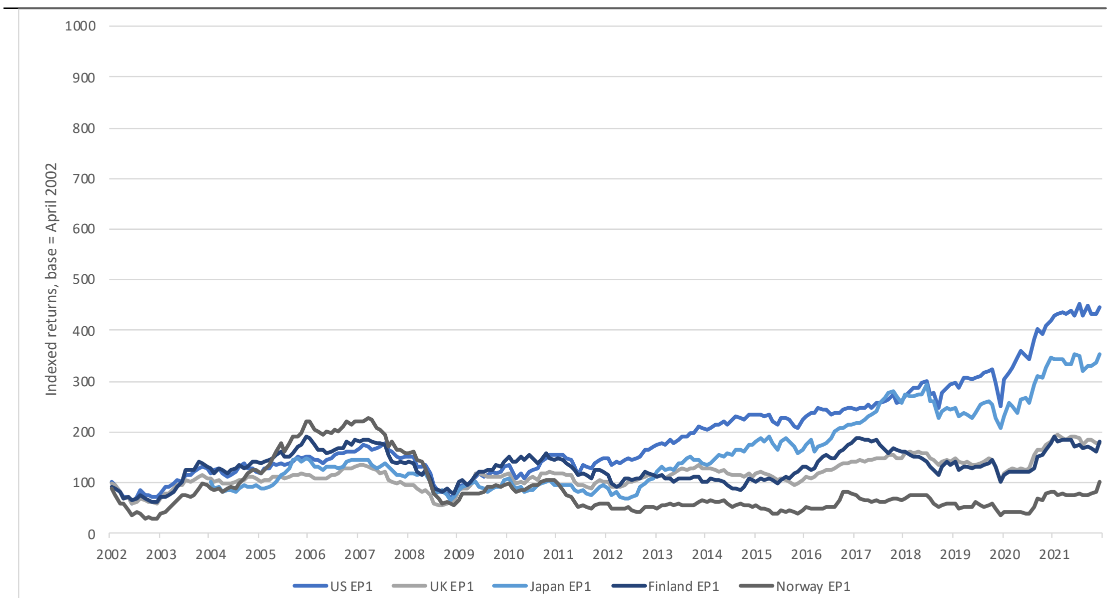


Exhibit 6.3: Indexed returns of the lowest earnings yield (EP1) portfolios from 2002-2022 across different countries

The exhibit compares the indexed returns of the lowest earnings yield portfolios (EP1) across the five different countries. April 2002 is used as a base. Japan first starts from 2004 due to a lack of data.



Despite EP5 yielding the highest absolute returns in the US, UK, Norway, and Finland, Table 6.4 below shows that we are largely unable to establish statistically significant grounds to suggest the outperformance of the portfolios with the highest earnings yield portfolios compared to those with the lowest earnings yields. A significant statistical relationship exists only in Finland at the 5% level and only in the UK at the 10% level. However, again we find no pattern between small and large capital markets.

Table 6.4: Hypothesis tests of earnings yield portfolios across countries from 2002-2022

The table presents the t-stats and critical values using a significance level of 5% for the five countries. We reject the null hypothesis (the absolute returns of the highest earnings yield portfolios are not statistically higher than the absolute returns of the lowest earnings yield portfolios and the SPX benchmark index) if the t-stat is higher than the critical value. We reject the null hypothesis if the p-value is below the significance level.

		EP5 vs. EP1	EP4 vs. EP2	EP5 vs. BM	EP4 vs. BM
US	t-stat	0.5296	-0.1848	0.9759	0.9422
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.2984	0.4268	0.1650	0.1735
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null
UK	t-stat	1.4786	-0.4462	1.8281	1.3459
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.0703	0.3279	0.0344	0.0898
	Conclusion	Do not reject the null	Do not reject the null	Reject the null	Do not reject the null
Japan	t-stat	-1.5486	0.7548	-0.4605	-0.0394
	Critical value (5%)	1.6520	1.6520	1.6520	1.6520
	p-value	0.0615	0.2256	0.3228	0.4843
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null
Finland	t-stat	1.8401	0.8815	2.5283	2.1295
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.0335	0.1895	0.0061	0.0171
	Conclusion	Reject the null	Do not reject the null	Reject the null	Reject the null
Norway	t-stat	1.0181	0.5257	-0.6899	-0.9165
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.1548	0.2998	0.2455	0.1802
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null

6.1.2 Size and stock returns

When analyzing the relationship between size and stock returns, our empirical results suggest that companies with the lowest market values also produce the highest absolute returns in the US in the period 2002-2022, thereby supporting the findings from Basu (1982) and Banz (1980). As seen in Table 6.5 below, MV1 yields an annualized average return of 13.01%, which compares to 7.40% for MV5. MV1 also yields a risk-adjusted return among the highest with a Sharpe ratio of 0.50, while it also produces the highest alpha with an annualized figure of 2.23%. On the other hand, MV5 produces a negative alpha and a Sharpe ratio of 0.41.

Table 6.5: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of SPX market value portfolios from 2002-2022

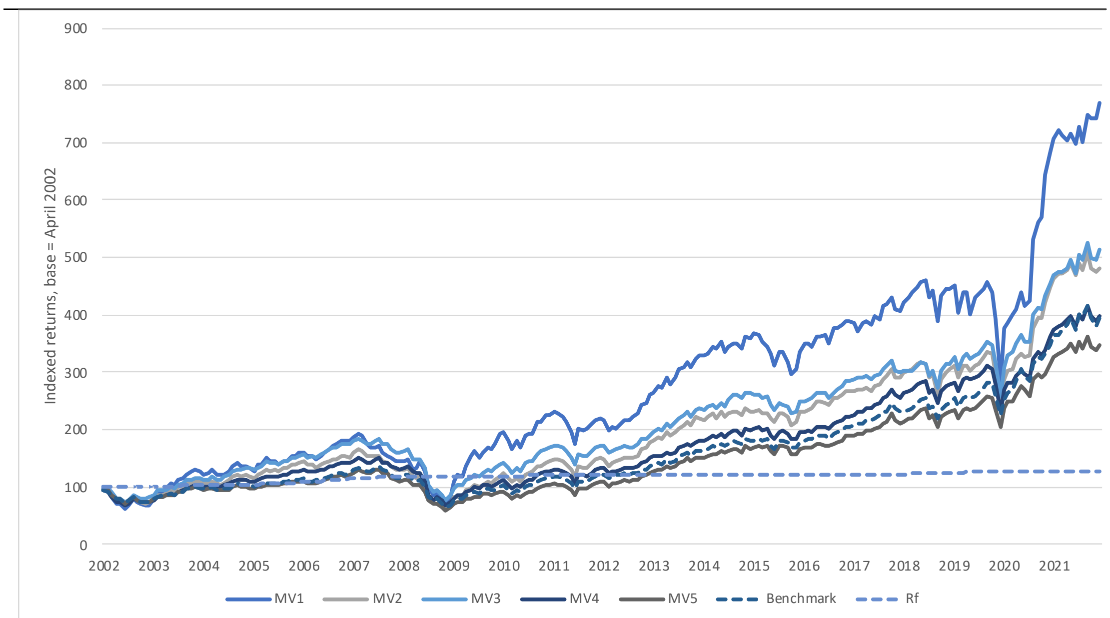
The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the market value portfolios consisting of SPX constituents from 2002-2022. MV1 includes the constituents with the lowest market values, while MV5 consists of the constituents with the highest market values. BM is the abbreviation for benchmark index and refers to the SPX index in the case of the US.

		MV1	MV2	MV3	MV4	MV5	BM	Risk-free
US	Return	13.0116	9.5409	9.6417	8.2002	7.4042	7.9788	1.2214
	Std.	23.7609	18.1938	16.8586	15.7557	15.2503	14.7051	0.4437
	Sharpe	0.4962	0.4573	0.4995	0.4429	0.4054	0.4595	
	Alpha	2.2262	0.4754	1.0284	0.0375	-0.7098		

Below we also graph the indexed returns of the SPX market value portfolios compared to the SPX benchmark index and risk-free rate from 2002-2022. MV1 has clearly outperformed all the other portfolios and its benchmark in most of the period.

Exhibit 6.4: Indexed returns of SPX market value portfolios vs. benchmark index and risk-free rate from 2002-2022

The exhibit compares the indexed returns of the five different market value portfolios made from the SPX constituents with the benchmark (SPX index for the US) and the risk-free rate. We use April 2002 as a base.



We proceed to statistically test for the absolute outperformance of the portfolios consisting of stocks with the lowest market values (MV1) versus the highest market values (MV5) and the benchmark index in Table 6.6 below. It becomes clear that MV1 produces statistically significant absolute returns higher than both MV5 and the benchmark in the 2002-2022 period. As such, this suggests that the size effect first established by Banz (1980) and later supported by Basu (1982) and others is still evident in the US market in the period 2002-2022.

Table 6.6: Hypothesis tests of SPX market value portfolios from 2002-2022

The table presents the t-stats and critical values using a significance level of 5%. We reject the null hypothesis (the absolute returns of the lowest market value portfolios are not statistically higher than the absolute returns of the highest market value portfolios and the SPX benchmark index) if the t-stat is higher than the critical value. We reject the null hypothesis if the p-value is below the significance level.

		MV1 vs. MV5	**MV2 vs. MV4**	**MV1 vs. BM**	**MV2 vs. BM**
US	t-stat	1.9612	1.1544	1.7328	1.0388
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.0255	0.1248	0.0422	0.1500
	Conclusion	Reject the null	Do not reject the null	Reject the null	Do not reject the null

Table 6.7 shows that MV1 produces the highest absolute returns across all five countries. Comparing the indexed returns of the lowest market value (MV1) portfolios with the highest market value (MV5) portfolios of the five portfolios in Exhibit 6.5 and Exhibit 6.6 below shows the clear outperformance of MV1 across all five countries. When adjusting for risk, MV1 also attains higher Sharpe ratios and alphas in all five countries compared to MV5, but the portfolios with the lowest market values also have by far the highest volatilities. Despite this, we are unable to identify any differences between small and large capital markets, meaning that we cannot reject the null hypothesis of *Hypothesis 1*.

Table 6.7: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of market value portfolios across countries from 2002-2022

The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the market value portfolios from 2002-2022 across the five different countries. MV1 includes the constituents with the lowest market values, while MV5 consists of the constituents with the highest market values. BM is the abbreviation for benchmark index and refers to the SPX index for the US, ASX for the UK, NIKKEI 225 for Japan, HEX for Finland, and OSEAX for Norway. Data for Japan only covers the period from 2004-2022 due to a lack of data.

		MV1	MV2	MV3	MV4	MV5	BM	Risk-free
US	Return	13.0116	9.5409	9.6417	8.2002	7.4042	7.9788	1.2214
	Std.	23.7609	18.1938	16.8586	15.7557	15.2503	14.7051	0.4437
	Sharpe	0.4962	0.4573	0.4995	0.4429	0.4054	0.4595	
	Alpha	2.2262	0.4754	1.0284	0.0375	-0.7098		
UK	Return	7.6346	6.6609	7.2400	5.3686	3.8912	3.4245	1.9158
	Std.	21.9437	18.1271	18.0779	17.4666	14.9861	13.7242	0.5948
	Sharpe	0.2606	0.2618	0.2945	0.1977	0.1318	0.1099	
	Alpha	4.0407	3.1852	3.6274	1.7747	0.3951		
Japan	Return	9.8170	7.9145	6.4520	4.7533	5.5555	6.5644	0.1267
	Std.	23.4984	21.4718	19.6202	18.4761	18.0273	18.5517	0.0710
	Sharpe	0.4124	0.3627	0.3224	0.2504	0.3011	0.3470	
	Alpha	2.2569	0.8429	-0.0960	-1.5005	-0.5291		
Finland	Return	10.0264	6.0757	8.3842	8.1240	7.3482	6.2585	1.0405
	Std.	20.5905	17.9141	16.0998	17.9549	18.4202	17.6774	0.4539
	Sharpe	0.4364	0.2811	0.4561	0.3945	0.3424	0.2952	
	Alpha	4.9570	0.8831	3.3235	2.4857	1.0784		
Norway	Return	17.0127	9.4574	2.1987	7.2164	7.6287	12.3743	2.3054
	Std.	28.6549	23.0704	21.7752	20.8065	20.3186	18.8203	0.5072
	Sharpe	0.5133	0.3100	-0.0049	0.2360	0.2620	0.5350	
	Alpha	5.7892	-1.9994	-9.5844	-4.4183	-4.8056		

Exhibit 6.5: Indexed returns of the lowest market value (MV1) portfolios from 2002-2022 across different countries

The exhibit compares the indexed returns of the lowest market value portfolios (MV1) across the five different countries. We use April 2002 as a base. Japan first starts from 2004 due to a lack of data.

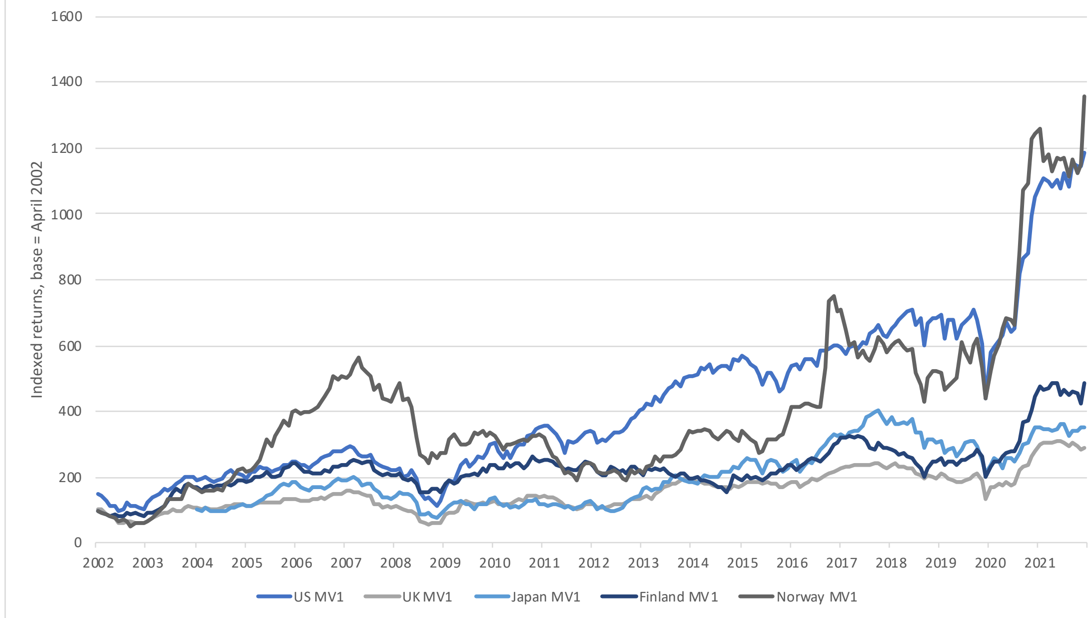
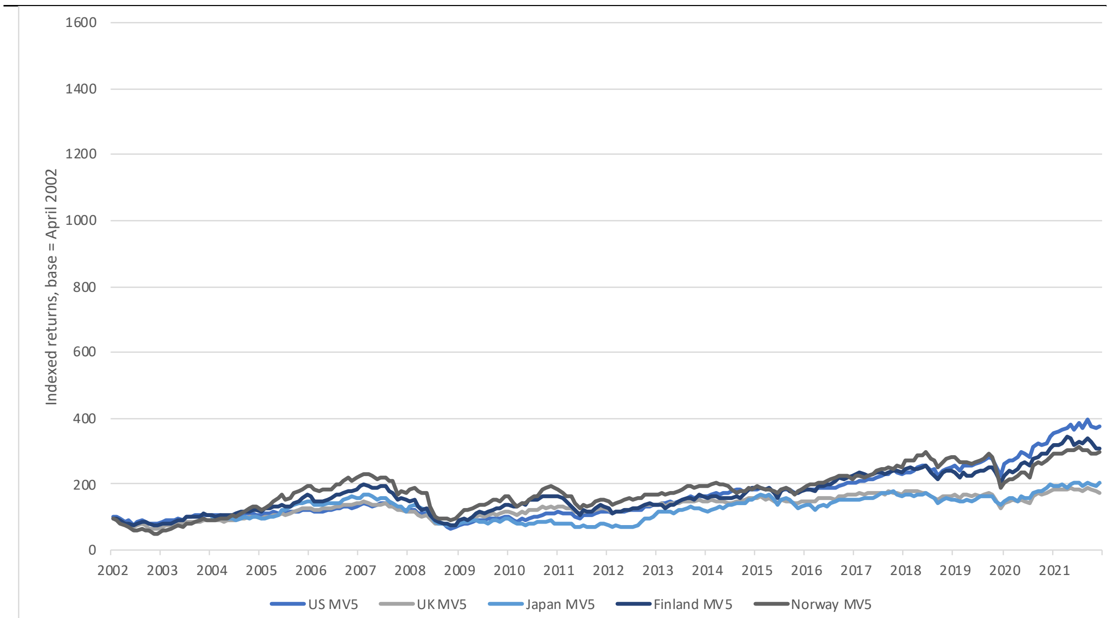


Exhibit 6.6: Indexed returns of the highest market value (MV5) portfolios from 2002-2022 across different countries

The exhibit compares the indexed returns of the highest market value portfolios (MV5) across the five different countries using April 2002 as a base. Japan first starts from 2004 due to a lack of data.



While MV1 yields the highest absolute returns in all five countries, Table 6.8 shows that a statistical outperformance of MV1 versus MV5 is only evident in the US and Norway (and Japan if we use a significance level of 10%). Again, however, we find no support to reject the null hypothesis of *Hypothesis 1*.

Table 6.8: Hypothesis tests of market value portfolios across countries from 2002-2022

The table presents the t-stats and critical values using a significance level of 5% for the five countries. We reject the null hypothesis (the absolute returns of the lowest market value portfolios are not statistically higher than the absolute returns of the highest market value portfolios and the SPX benchmark index) if the t-stat is higher than the critical value. We reject the null hypothesis if the p-value is below the significance level.

		MV1 vs. MV5	MV2 vs. MV4	MV1 vs. BM	MV2 vs. BM
US	t-stat	1.9612	1.1544	1.7328	1.0388
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.0255	0.1248	0.0422	0.1500
	Conclusion	Reject the null	Do not reject the null	Reject the null	Do not reject the null
UK	t-stat	1.1197	0.7044	1.1888	1.2821
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.1320	0.2409	0.1179	0.1005
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null
Japan	t-stat	1.6191	1.9115	1.3694	0.7237
	Critical value (5%)	1.6520	1.6520	1.6520	1.6520
	p-value	0.0534	0.0286	0.0862	0.2350
	Conclusion	Do not reject the null	Reject the null	Do not reject the null	Do not reject the null
Finland	t-stat	0.7303	-0.8266	1.0575	-0.0701
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.2330	0.2047	0.1457	0.4721
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null
Norway	t-stat	1.8519	0.7265	0.8862	-0.8375
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.0326	0.2341	0.1882	0.2016
	Conclusion	Reject the null	Do not reject the null	Do not reject the null	Do not reject the null

6.1.3 Randomized earnings yield and stock returns

To check for the robustness of the earnings yield effects covered above, we randomize the earnings yield portfolios (please refer to section 5.2 in the methodology section for an explanation). This approach moves our results further away from Basu's (1982) findings. In the US, EP3* yields both the highest absolute and risk-adjusted returns. EP5* yields the poorest risk-adjusted return in the 2002-2022 period in the US, slightly below EP1*.

Table 6.9: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of SPX randomized earnings yield portfolios from 2002-2022

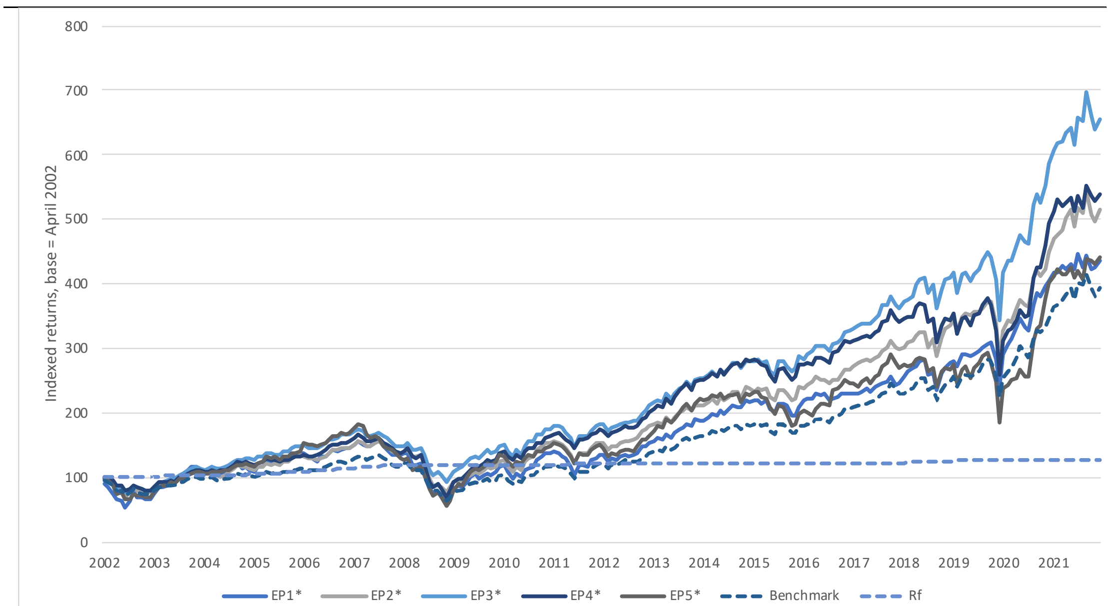
The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the randomized earnings yield portfolios consisting of SPX constituents from 2002-2022. EP1* includes the constituents with the lowest randomized earnings yields, while EP5* consists of the constituents with the highest randomized earnings yields. BM is the abbreviation for benchmark index and refers to the SPX index in the case of the US.

		EP1*	EP2*	EP3*	EP4*	EP5*	BM	Risk-free
US	Return	9.4563	9.5697	10.5965	9.9284	9.6760	7.9788	1.2214
	Std.	20.3685	16.3693	15.2895	17.0595	21.1543	14.7051	0.4437
	Sharpe	0.4043	0.5100	0.6132	0.5104	0.3997	0.4595	
	Alpha	-0.3130	1.1942	2.6755	1.3950	-0.1212		

Plotting the indexed returns in Exhibit 6.7 also shows the outperformance of EP3*, which particularly accelerated during COVID-19.

Exhibit 6.7: Indexed returns of SPX randomized earnings yield portfolios vs. benchmark index and risk-free rate from 2002-2022

The exhibit compares the indexed returns of the five different randomized earnings yield portfolios made from the SPX constituents with the benchmark (SPX index for the US) and the risk-free rate using April 2002 as a base.



Considering the results above, it is no surprise that the randomized earnings yield effect is not statistically significant in the US in the period, as shown in Table 6.10.

Table 6.10: Hypothesis tests of SPX randomized earnings yield portfolios from 2002-2022

The table presents the t-stats and critical values using a significance level of 5%. We reject the null hypothesis (the absolute returns of the highest randomized earnings yield portfolios are not statistically higher than the absolute returns of the lowest randomized earnings yield portfolios and the SPX benchmark index) if the t-stat is higher than the critical value. We reject the null hypothesis if the p-value is below the significance level.

		EP5* vs. EP1*	EP4* vs. EP2*	EP5* vs. BM	EP4* vs. BM
US	t-stat	0.0831	0.2374	0.7081	1.3910
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.4669	0.4063	0.2398	0.0828
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null

Table 6.11 shows that the results from the other four countries are materially different from the US, however. EP5* produces higher absolute returns compared to EP1* over the period in the UK, Finland, and Norway. The results in Japan remain the opposite, i.e. EP1* produces higher absolute returns than EP5*. The risk-adjusted returns in the four countries paint a similar picture as the absolute returns. Given this, however, we are not able to suggest a clear difference between small and large capital markets, i.e. we cannot reject the null hypothesis of *Hypothesis 1*.

Table 6.11: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of randomized earnings yield portfolios across countries from 2002-2022

The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the randomized earnings yield portfolios from 2002-2022 across the five different countries. EP1* includes the constituents with the lowest randomized earnings yields, while EP5* consists of the constituents with the highest randomized earnings yields. BM is the abbreviation for benchmark index and refers to the SPX index for the US, ASX for the UK, NIKKEI 225 for Japan, HEX for Finland, and OSEAX for Norway. Data for Japan only covers the period from 2004-2022 due to a lack of data.

		EP1*	EP2*	EP3*	EP4*	EP5*	BM	Risk-free
US	Return	9.4563	9.5697	10.5965	9.9284	9.6760	7.9788	1.2214
	Std.	20.3685	16.3693	15.2895	17.0595	21.1543	14.7051	0.4437
	Sharpe	0.4043	0.5100	0.6132	0.5104	0.3997	0.4595	
	Alpha	-0.3130	1.1942	2.6755	1.3950	-0.1212		
UK	Return	3.6940	6.8954	7.0214	6.0822	8.3764	3.4245	1.9158
	Std.	20.7688	16.1858	15.8996	16.1908	20.0460	13.7242	0.5948
	Sharpe	0.0856	0.3077	0.3211	0.2573	0.3223	0.1099	
	Alpha	-0.0729	3.4497	3.6043	2.6464	4.7416		
Japan	Return	8.6583	6.5653	6.4323	6.4172	5.1893	6.5644	0.1267
	Std.	21.7116	19.1139	19.2660	19.9965	22.0950	18.5517	0.0710
	Sharpe	0.3930	0.3369	0.3273	0.3146	0.2291	0.3470	
	Alpha	1.6694	0.1409	-0.0533	-0.1758	-1.9228		
Finland	Return	4.0419	8.6346	8.6644	8.4163	12.1112	6.2585	1.0405
	Std.	21.0571	18.7732	16.1886	16.2373	17.2485	17.6774	0.4539
	Sharpe	0.1425	0.4045	0.4709	0.4543	0.6418	0.2952	
	Alpha	-2.1841	3.1081	3.6446	3.2888	6.6482		
Norway	Return	3.7770	4.1144	11.3608	11.6997	11.1249	12.3743	2.3054
	Std.	30.1232	23.0311	20.1000	16.8376	21.2297	18.8203	0.5072
	Sharpe	0.0489	0.0785	0.4505	0.5579	0.4154	0.5350	
	Alpha	-10.9302	-7.4922	0.7181	2.3042	-0.0883		

Exhibit 6.8: Indexed returns of the highest randomized earnings yield (EP5*) portfolios from 2002-2022 across different countries

The exhibit compares the indexed returns of the highest randomized earnings yield portfolios (EP5*) across the five different countries. April 2002 is used as a base. Japan first starts from 2004 due to a lack of data.

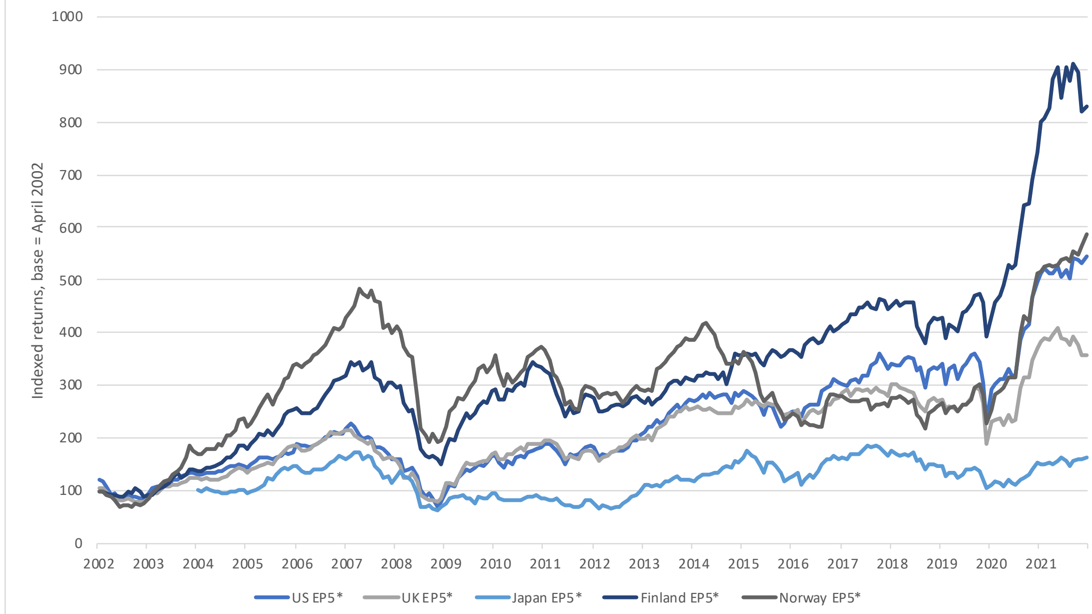
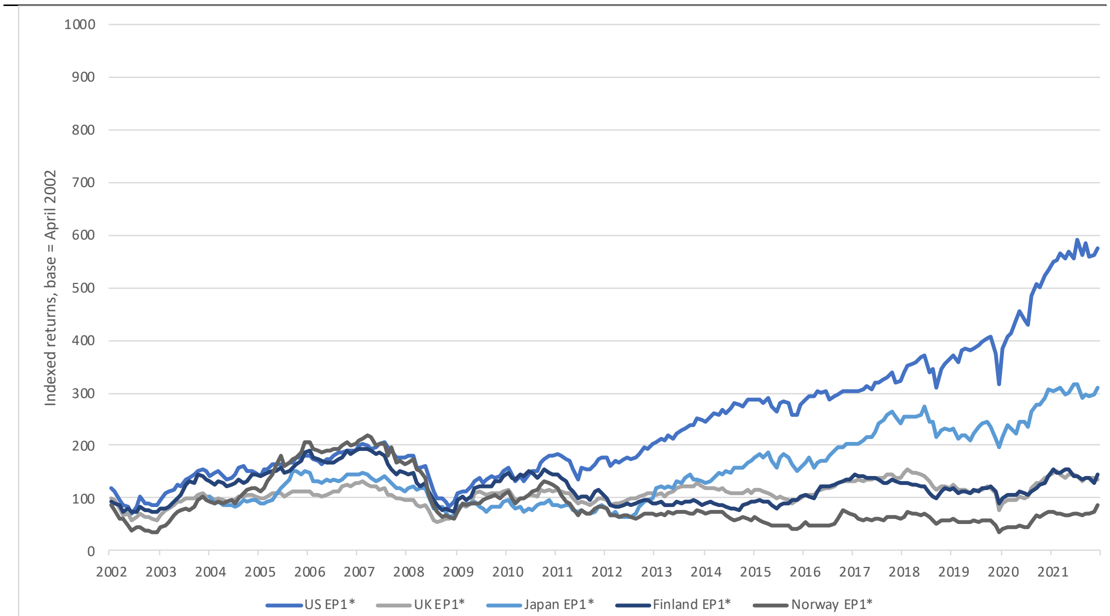


Exhibit 6.9: Indexed returns of the lowest randomized earnings yield (EP1*) portfolios from 2002-2022 across different countries

The exhibit compares the indexed returns of the lowest randomized earnings yield portfolios (EP1*) across the five different countries. April 2002 is used as a base. Japan first starts from 2004 due to a lack of data.



Excluding the US and Japan, the randomized earnings yield effect is significant at the 5% level in both the UK, Finland, and Norway, with the absolute returns of EP5* significantly higher than those of EP1*. Again, we do not find support to reject the null hypothesis of *Hypothesis 1*.

Table 6.12: Hypothesis tests of randomized earnings yield portfolios across countries from 2002-2022

The table presents the t-stats and critical values using a significance level of 5% for the five countries. We reject the null hypothesis (the absolute returns of the highest randomized earnings yield portfolios are not statistically higher than the absolute returns of the lowest randomized earnings yield portfolios and the SPX benchmark index) if the t-stat is higher than the critical value. We reject the null hypothesis if the p-value is below the significance level.

		EP5* vs. EP1*	EP4* vs. EP2*	EP5* vs. BM	EP4* vs. BM
US	t-stat	0.0831	0.2374	0.7081	1.3910
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.4669	0.4063	0.2398	0.0828
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null
UK	t-stat	1.9349	-0.5549	1.7454	1.4110
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.0271	0.2897	0.0411	0.0798
	Conclusion	Reject the null	Do not reject the null	Reject the null	Do not reject the null
Japan	t-stat	-1.3363	-0.0802	-0.6311	-0.0861
	Critical value (5%)	1.6520	1.6520	1.6520	1.6520
	p-value	0.0914	0.4681	0.2643	0.4657
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null
Finland	t-stat	2.9393	-0.0904	2.9209	1.0369
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.0018	0.4640	0.0019	0.1504
	Conclusion	Reject the null	Do not reject the null	Reject the null	Do not reject the null
Norway	t-stat	1.9130	2.3228	-0.4186	-0.2560
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.0285	0.0105	0.3379	0.3991
	Conclusion	Reject the null	Reject the null	Do not reject the null	Do not reject the null

6.1.4 Randomized market value and stock returns

To check for robustness of the size effect covered above, we also randomize based on market values (please refer to section 5.2 in the methodology section for an explanation of this approach). Doing this, the portfolios with the lowest randomized market values still outperform those with larger randomized market values in the US from 2002-2022, as shown in Table 6.13. The risk-adjusted returns of MV1* are also better than those of MV5* and the benchmark. Again, the volatility of MV1* is significantly higher than MV5* and the benchmark.

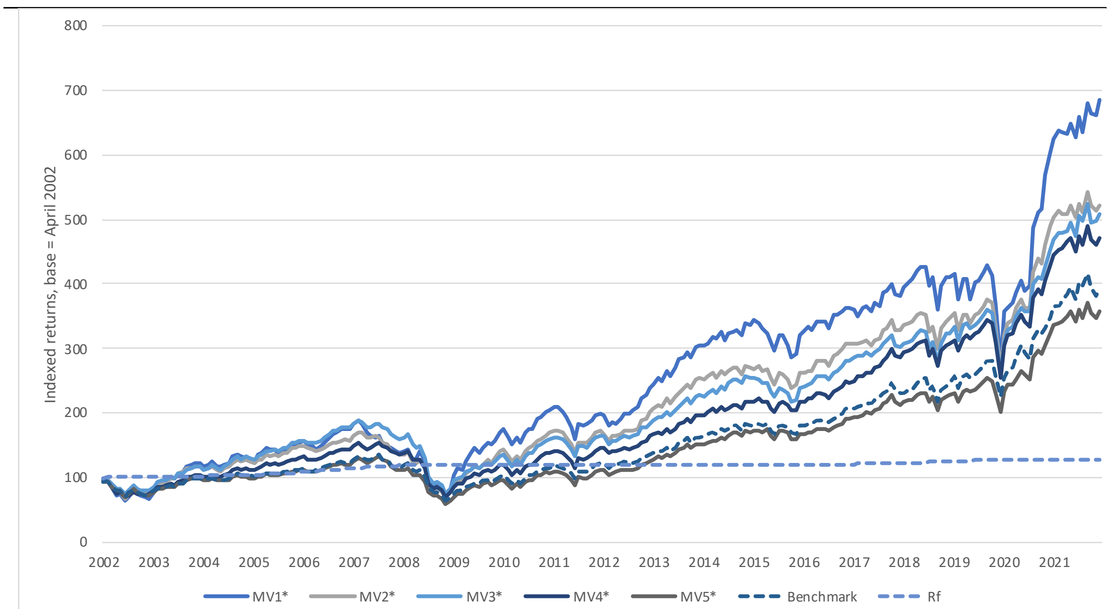
Table 6.13: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of SPX randomized market value portfolios from 2002-2022

The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the randomized market value portfolios consisting of SPX constituents from 2002-2022. MV1* includes the constituents with the lowest randomized market values, while MV5* consists of the constituents with the highest randomized market values. BM is the abbreviation for benchmark index and refers to the SPX index in the case of the US.

		MV1*	MV2*	MV3*	MV4*	MV5*	BM	Risk-free
US	Return	12.0357	9.9617	9.6385	9.0534	7.6078	7.9788	1.2214
	Std.	21.8738	18.3135	17.0337	15.8513	15.6623	14.7051	0.4437
	Sharpe	0.4944	0.4773	0.4941	0.4941	0.4078	0.4595	
	Alpha	1.8402	0.8636	0.9711	0.8333	-0.6574		

Exhibit 6.10: Indexed returns of SPX randomized market value portfolios vs. benchmark index and risk-free rate from 2002-2022

The exhibit compares the indexed returns of the five different randomized market value portfolios made from the SPX index with the benchmark (SPX index for the US) and the risk-free rate using April 2002 as a base.



Testing for the significance of the higher returns of the portfolio consisting of the lowest market values, Table 6.14 shows that MV1* statistically outperforms both MV5* and its benchmark.

Table 6.14: Hypothesis tests of SPX randomized market value portfolios from 2002-2022

The table presents the t-stats and critical values using a significance level of 5%. We reject the null hypothesis (the absolute returns of the lowest randomized market value portfolios are not statistically higher than the absolute returns of the highest randomized market value portfolios and the SPX benchmark index) if the t-stat is higher than the critical value. We reject the null hypothesis if the p-value is below the significance level.

		MV1* vs. MV5*	MV2* vs. MV4*	MV1* vs. BM	MV2* vs. BM
US	t-stat	1.9321	0.8280	1.6538	1.2866
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.0273	0.2042	0.0497	0.0997
	Conclusion	Reject the null	Do not reject the null	Reject the null	Do not reject the null

As shown in Table 6.15, the randomized size effect is also not only visible in the US in the 2002-2022 period, as the lowest market value portfolios MV1* yield much higher absolute returns compared to MV5* in all other four countries as well. This is also the case for risk-adjusted returns. Notably, however, we detect a visible difference between the countries with large and small capital markets, as the difference in both absolute and risk-adjusted returns of MV1* compared to MV5* in both Finland and Norway is much stronger than in the US, the UK, and Japan. Thus, we do see a slight pattern of higher returns in the smaller capital markets compared to the larger capital markets, indicating that the null hypothesis could potentially be rejected.

Table 6.15: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of randomized market value portfolios across countries from 2002-2022

The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the randomized market value portfolios from 2002-2022 across the five different countries. MV1 includes the constituents with the lowest randomized market values, while MV5 consists of the constituents with the highest randomized market values. BM is the abbreviation for benchmark index and refers to the SPX index for the US, ASX for the UK, NIKKEI 225 for Japan, HEX for Finland, and OSEAX for Norway. Data for Japan only covers the period from 2004-2022 due to a lack of data.

		MV1*	**MV2***	**MV3***	**MV4***	**MV5***	**BM**	**Risk-free**
US	Return	12.0357	9.9617	9.6385	9.0534	7.6078	7.9788	1.2214
	Std.	21.8738	18.3135	17.0337	15.8513	15.6623	14.7051	0.4437
	Sharpe	0.4944	0.4773	0.4941	0.4941	0.4078	0.4595	
	Alpha	1.8402	0.8636	0.9711	0.8333	-0.6574		
UK	Return	7.6225	7.4622	6.3947	5.4340	4.7238	3.4245	1.9158
	Std.	20.2677	18.0416	17.8330	17.9330	15.3197	13.7242	0.5948
	Sharpe	0.2816	0.3074	0.2512	0.1962	0.1833	0.1099	
	Alpha	4.1117	3.9858	2.8130	1.7889	1.2098		
Japan	Return	8.4432	7.2903	7.2952	4.4166	5.7128	6.5644	0.1267
	Std.	22.8504	21.7399	19.0594	19.6626	18.0539	18.5517	0.0710
	Sharpe	0.3640	0.3295	0.3761	0.2182	0.3094	0.3470	
	Alpha	1.1057	0.0718	0.9551	-2.2541	-0.3894		
Finland	Return	13.9438	4.3797	9.6751	9.2340	5.3281	6.2585	1.0405
	Std.	18.8996	16.4919	17.6992	18.1140	19.0697	17.6774	0.4539
	Sharpe	0.6827	0.2025	0.4879	0.4523	0.2248	0.2952	
	Alpha	8.9590	-0.6747	4.2212	3.4782	-1.0528		
Norway	Return	16.1272	8.7905	4.7085	6.8612	5.4621	12.3743	2.3054
	Std.	24.2638	21.8864	22.5049	23.6930	22.9358	18.8203	0.5072
	Sharpe	0.5696	0.2963	0.1068	0.1923	0.1376	0.5350	
	Alpha	6.3313	-1.9345	-7.2606	-6.0261	-7.9159		

Exhibit 6.11: Indexed returns of the lowest randomized market value (MV1*) portfolios from 2002-2022 across different countries

The exhibit compares the indexed returns of the lowest randomized market value portfolios (MV1*) across the five different countries. We use April 2002 as a base. Japan first starts from 2004 due to a lack of data.

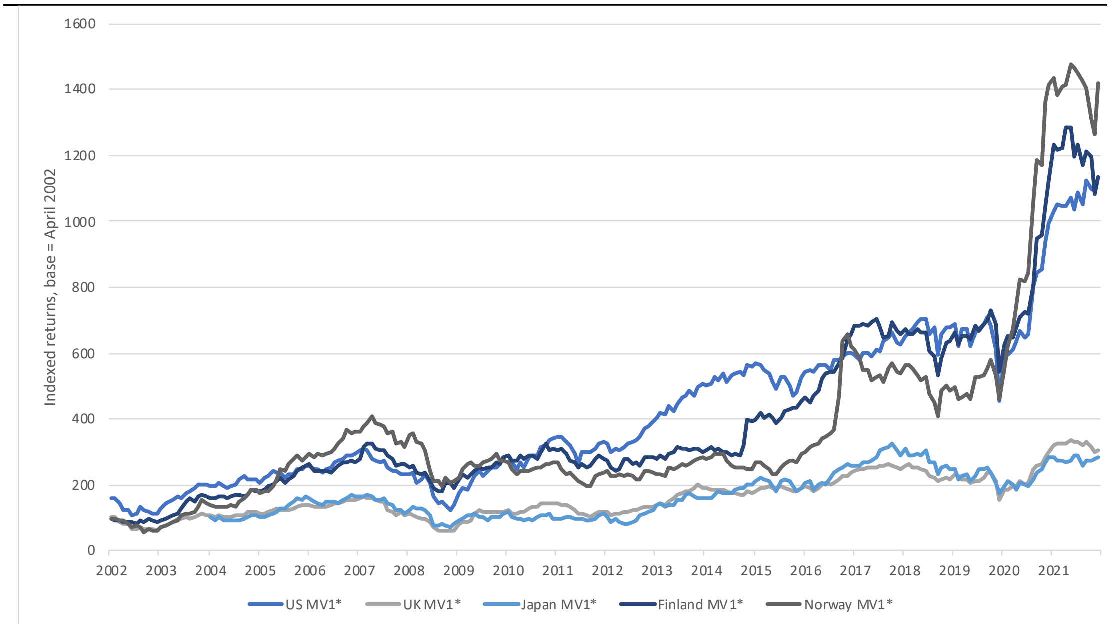
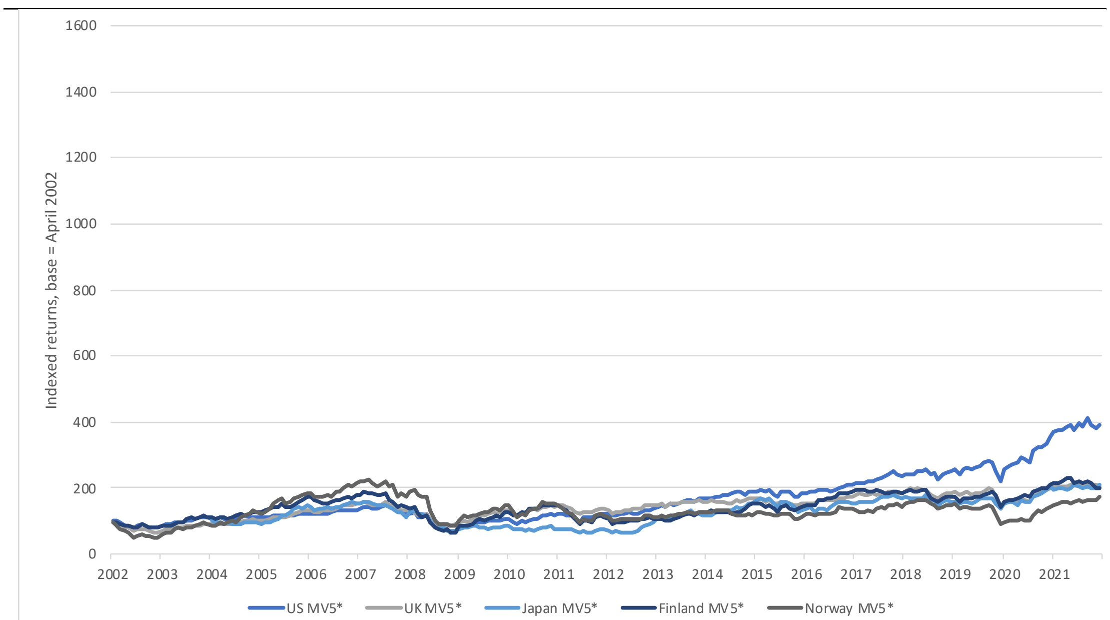


Exhibit 6.12: Indexed returns of the highest randomized market value (MV5*) portfolios from 2002-2022 across different countries

The exhibit compares the indexed returns of the highest randomized market value portfolios (MV5*) across the five different countries using April 2002 as a base. Japan first starts from 2004 due to a lack of data.



Supporting our interpretation above, testing for the significance of the outperformance of MV1* compared to MV5* also appears more evident in the small capital markets of Finland and Norway compared to the larger capital markets (albeit the outperformance is also significant in the US). However, we are unable to establish a clear difference between small and large capital markets.

Table 6.16: Hypothesis tests of randomized market value portfolios across countries from 2002-2022

The table presents the t-stats and critical values using a significance level of 5% for the five countries. We reject the null hypothesis (the absolute returns of the lowest randomized market value portfolios are not statistically higher than the absolute returns of the highest randomized market value portfolios and the SPX benchmark index) if the t-stat is higher than the critical value. We reject the null hypothesis if the p-value is below the significance level.

		MV1* vs. MV5*	MV2* vs. MV4*	MV1* vs. BM	MV2* vs. BM
US	t-stat	1.9321	0.8280	1.6538	1.2866
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.0273	0.2042	0.0497	0.0997
	Conclusion	Reject the null	Do not reject the null	Reject the null	Do not reject the null
UK	t-stat	0.9935	1.1846	1.3246	1.6205
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.1607	0.1187	0.0933	0.0532
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null
Japan	t-stat	1.1107	1.8570	0.8165	0.4026
	Critical value (5%)	1.6520	1.6520	1.6520	1.6520
	p-value	0.1340	0.0323	0.2076	0.3438
	Conclusion	Do not reject the null	Reject the null	Do not reject the null	Do not reject the null
Finland	t-stat	2.6574	-2.1311	2.4471	-0.8250
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.0042	0.0171	0.0076	0.2051
	Conclusion	Reject the null	Reject the null	Reject the null	Do not reject the null
Norway	t-stat	2.3584	0.6053	0.8229	-1.0327
	Critical value (5%)	1.6513	1.6513	1.6513	1.6513
	p-value	0.0096	0.2728	0.2057	0.1514
	Conclusion	Reject the null	Do not reject the null	Do not reject the null	Do not reject the null

6.2 Hypothesis 2: Differences in the earnings yield and size effects over time

While 2002-2022 covers a period where stock prices have generally increased, it also characterizes a period with several busts with stocks facings major backlashes, such as during the financial crisis of 2008 and at the initial outbreak of the COVID-19 pandemic.

With our findings from our first hypothesis in mind, we believe it is worthwhile to investigate whether it is possible to map any differences and changing trends over time in the relationship between earnings yield, size, and stock returns across capital markets of different sizes. We thus separate our sample into two to compare the early part of the sample with the late part of the sample: From April 2002 to March 2012 and from April 2012 to March 2022. This provides a roughly even split of observations across the two subsamples.

Please refer to section 8.2 in the appendix for tests of statistical significance of the different indices' earnings yield and market value portfolios over time.

6.2.1 Earnings yield and stock returns over time

In the 2002-2012 period, EP5 outperforms EP1 on both an absolute and risk-adjusted basis across all countries except Japan. In the 2012-2022 period, however, EP5 appears to perform significantly worse relative to EP1 in the US, while the highest earnings yield portfolios do not appear as the best performing portfolios in the UK and Norway. However, Finland's EP5 is a clear outperformer in the latter period as well. Concerning *Hypothesis 2*, we find some evidence to reject the null hypothesis in the 2002-2012 period but not in the 2012-2022 period, implying that we can only map a difference between the small and large capital markets in the former period.

Table 6.17: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of earnings yield portfolios across countries from 2002-2012

The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the earnings yield portfolios from 2002-2012 across the five different countries. EP1 includes the constituents with the lowest earnings yields, while EP5 consists of the constituents with the highest earnings yields. BM is the abbreviation for benchmark index and refers to the SPX index for the US, ASX for the UK, NIKKEI 225 for Japan, HEX for Finland, and OSEAX for Norway. Data for Japan only covers the period from 2004-2012 due to a lack of data.

		2002-2012						
		EP1	**EP2**	**EP3**	**EP4**	**EP5**	**BM**	**Risk-free**
US	Return	6.0677	5.5196	7.4781	6.0604	7.2405	3.3464	1.8521
	Std.	25.7055	17.1513	16.1851	17.0381	22.8030	15.9882	0.5259
	Sharpe	0.1640	0.2138	0.3476	0.2470	0.2363	0.0935	
	Alpha	1.9983	2.1372	4.1676	2.6888	3.5052		
UK	Return	3.3178	5.7843	4.0373	4.6545	7.5501	2.7903	3.3957
	Std.	24.8806	17.9658	16.8255	16.9084	21.1289	15.2943	0.5819
	Sharpe	-0.0031	0.1329	0.0381	0.0744	0.1966	-0.0396	
	Alpha	0.6726	3.0321	1.2296	1.8432	4.7883		
Japan	Return	2.4922	-3.7717	1.4139	-0.2293	0.3564	0.2110	0.2941
	Std.	24.0269	20.0451	19.8113	20.3130	23.6900	20.1553	0.0795
	Sharpe	0.0915	-0.2028	0.0565	-0.0258	0.0026	-0.0041	
	Alpha	2.2888	-3.9868	1.1988	-0.4431	0.1542		
Finland	Return	4.8703	5.9016	4.7854	8.0601	11.4435	4.0454	2.3134
	Std.	24.6502	17.1217	18.8658	18.0718	19.1786	20.0831	0.3675
	Sharpe	0.1037	0.2096	0.1310	0.3180	0.4761	0.0862	
	Alpha	0.7964	2.3451	1.0695	4.3122	7.7447		
Norway	Return	0.6566	12.7553	5.2814	11.2095	12.7751	13.0318	3.5138
	Std.	33.6676	27.4987	20.0396	18.5328	24.2858	23.2030	0.4986
	Sharpe	-0.0849	0.3361	0.0882	0.4152	0.3813	0.4102	
	Alpha	-12.7886	0.1936	-5.1524	1.2281	0.7261		

Table 6.18: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of earnings yield portfolios across countries from 2012-2022

The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the earnings yield portfolios from 2012-2022 across the five different countries. EP1 includes the constituents with the lowest earnings yields, while EP5 consists of the constituents with the highest earnings yields. BM is the abbreviation for benchmark index and refers to the SPX index for the US, ASX for the UK, NIKKEI 225 for Japan, HEX for Finland, and OSEAX for Norway.

		2012-2022						
		EP1	**EP2**	**EP3**	**EP4**	**EP5**	**BM**	**Risk-free**
US	Return	12.1368	13.4478	13.2159	12.3583	14.0307	12.6112	0.5908
	Std.	15.1820	13.9931	13.7414	16.3883	22.1361	13.2313	0.2279
	Sharpe	0.7605	0.9188	0.9188	0.7180	0.6071	0.9085	
	Alpha	-0.9735	0.7828	0.7746	-2.0190	-3.6889		
UK	Return	6.9286	7.1874	6.9600	7.0252	9.8130	4.0587	0.4358
	Std.	16.6546	13.1320	13.4755	14.4590	19.0847	12.0129	0.0617
	Sharpe	0.3898	0.5141	0.4841	0.4557	0.4913	0.3016	
	Alpha	2.3157	3.3669	3.1059	2.9199	4.7718		
Japan	Return	15.1835	12.0014	9.8535	11.8760	9.6937	11.6471	-0.0073
	Std.	20.6032	17.4680	18.6855	19.8566	21.1329	17.1061	0.0258
	Sharpe	0.7373	0.6875	0.5277	0.5985	0.4590	0.6813	
	Alpha	2.6765	0.7966	-2.0814	-0.3899	-2.9424		
Finland	Return	6.2828	10.2118	10.8589	11.8557	12.2219	8.4716	-0.2324
	Std.	21.1945	16.4884	15.2766	15.7303	15.3613	14.9485	0.0798
	Sharpe	0.3074	0.6334	0.7260	0.7685	0.8108	0.5823	
	Alpha	-1.7396	2.2494	3.4724	4.0738	4.8455		
Norway	Return	10.2834	3.9535	9.7296	9.1575	7.8422	11.7169	1.0971
	Std.	32.8970	21.3126	15.3294	13.1438	21.3816	13.1504	0.1508
	Sharpe	0.2792	0.1340	0.5631	0.6132	0.3155	0.8076	
	Alpha	-8.9251	-9.9560	-1.1350	-0.1174	-6.5558		

6.2.2 Size and stock returns over time

We note a more visible difference between size and stock returns in the two periods. This relationship appears much stronger in 2002-2012 in all countries, with MV1 outperforming MV5 on both an absolute and risk-adjusted basis in all five countries. The relationship, however, is not as clear in the 2012-2022 period, where only the UK and Norway see their MV1 portfolios outperforming the MV5 portfolios. We cannot suggest a difference between the performance across capital market sizes in any of the periods, i.e. we cannot reject the null hypothesis of *Hypothesis 2*.

Table 6.19: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of market value portfolios across countries from 2002-2012

The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the market value portfolios from 2002-2012 across the five different countries. MV1 includes the constituents with the lowest market values, while MV5 consists of the constituents with the highest market values. BM is the abbreviation for benchmark index and refers to the SPX index for the US, ASX for the UK, NIKKEI 225 for Japan, HEX for Finland, and OSEAX for Norway. Data for Japan only covers the period from 2004-2012 due to a lack of data.

		2002-2012						
		MV1	**MV2**	**MV3**	**MV4**	**MV5**	**BM**	**Risk-free**
US	Return	11.1752	6.1023	7.2278	4.4216	2.3292	3.3464	1.8521
	Std.	25.8489	19.8993	18.5166	17.3195	16.7539	15.9882	0.5259
	Sharpe	0.3607	0.2136	0.2903	0.1484	0.0285	0.0935	
	Alpha	7.1534	2.4921	3.7095	1.0176	-1.0657		
UK	Return	4.4580	4.9870	7.3147	4.1729	3.5959	2.7903	3.3957
	Std.	24.5171	19.7859	20.1898	19.2165	16.4543	15.2943	0.5819
	Sharpe	0.0433	0.0804	0.1941	0.0404	0.0122	-0.0396	
	Alpha	1.7122	2.2047	4.6131	1.4466	0.8262		
Japan	Return	6.3187	1.8519	0.3941	-2.9218	-0.7911	0.2110	0.2941
	Std.	25.0703	22.6778	20.0074	19.6378	18.7364	20.1553	0.0795
	Sharpe	0.2403	0.0687	0.0050	-0.1638	-0.0579	-0.0041	
	Alpha	6.1223	1.6472	0.1792	-3.1369	-1.0115		
Finland	Return	10.6288	3.7216	5.8271	7.9669	4.9335	4.0454	2.3134
	Std.	19.2686	19.6045	17.1066	19.4948	20.9896	20.0831	0.3675
	Sharpe	0.4315	0.0718	0.2054	0.2900	0.1248	0.0862	
	Alpha	7.1173	0.0756	2.2380	4.1717	0.8516		
Norway	Return	12.6453	11.1793	4.2257	10.0111	7.3193	13.0318	3.5138
	Std.	27.6027	25.0480	23.5772	23.9394	24.6144	23.2030	0.4986
	Sharpe	0.3308	0.3060	0.0302	0.2714	0.1546	0.4102	
	Alpha	2.1244	-0.1906	-7.4495	-1.9714	-5.6705		

Table 6.20: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of market value portfolios across countries from 2012-2022

The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the market value portfolios from 2012-2022 across the five different countries. MV1 includes the constituents with the lowest market values, while MV5 consists of the constituents with the highest market values. BM is the abbreviation for benchmark index and refers to the SPX index for the US, ASX for the UK, NIKKEI 225 for Japan, HEX for Finland, and OSEAX for Norway.

		2012-2022						
		MV1	**MV2**	**MV3**	**MV4**	**MV5**	**BM**	**Risk-free**
US	Return	14.8479	12.9795	12.0557	11.9788	12.4792	12.6112	0.5908
	Std.	21.5679	16.3353	15.0654	14.0074	13.4935	13.2313	0.2279
	Sharpe	0.6610	0.7584	0.7610	0.8130	0.8810	0.9085	
	Alpha	-2.3651	-1.3939	-1.4561	-0.8132	-0.1347		
UK	Return	10.8113	8.3347	7.1653	6.5643	4.1865	4.0587	0.4358
	Std.	19.0870	16.3705	15.7714	15.5952	13.4273	12.0129	0.0617
	Sharpe	0.5436	0.4825	0.4267	0.3930	0.2793	0.3016	
	Alpha	6.1238	4.0337	2.7800	2.0602	-0.1244		
Japan	Return	12.6156	12.7645	11.2984	10.8934	10.6327	11.6471	-0.0073
	Std.	22.2347	20.4440	19.2743	17.3712	17.3790	17.1061	0.0258
	Sharpe	0.5677	0.6247	0.5866	0.6275	0.6122	0.6813	
	Alpha	-0.6885	0.1306	-0.9014	-0.1649	-0.6339		
Finland	Return	9.4239	8.4298	10.9413	8.2812	9.7629	8.4716	-0.2324
	Std.	21.9125	16.1014	15.0616	16.3529	15.4893	14.9485	0.0798
	Sharpe	0.4407	0.5380	0.7419	0.5206	0.6453	0.5823	
	Alpha	1.6398	1.3316	3.9471	0.4157	1.5729		
Norway	Return	21.3801	7.7356	0.1718	4.4217	7.9380	11.7169	1.0971
	Std.	29.7321	21.0015	19.8928	17.1770	14.9424	13.1504	0.1508
	Sharpe	0.6822	0.3161	-0.0465	0.1935	0.4578	0.8076	
	Alpha	5.9002	-5.7662	-13.6831	-7.7163	-4.1913		

6.2.3 Randomized earnings yield and stock returns over time

When randomizing earnings yield, we obtain results that indicate the presence of a stronger earnings yield effect in smaller capital markets, especially in the 2002-2012 period. In the former period, all countries' EP5* portfolios outperform their EP1* portfolios (except in Japan, which is no surprise), but Norway and Finland appear to have earned much higher risk-adjusted returns compared to the US and UK. In the 2012-2022 period, the division in performance of the highest randomized earnings yield portfolios compared to the lowest randomized earnings yield portfolios between the small and large capital markets appears less clear. While Finland's EP5* is a clear outperformer in the latter period, we find no evidence of EP5* being the best-performing portfolio in the US, the UK, Japan, and Norway. Overall, we find evidence to reject the null hypothesis of *Hypothesis 2* in the 2002-2012 period, but not in the 2012-2022 period, meaning that we can only map a difference across capital market sizes in the former period.

Table 6.21: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of randomized earnings yield portfolios across countries from 2002-2012

The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the randomized earnings yield portfolios from 2002-2012 across the five different countries. EP1* includes the constituents with the lowest randomized earnings yields, while EP5* consists of the constituents with the highest randomized earnings yields. BM is the abbreviation for benchmark index and refers to the SPX index for the US, ASX for the UK, NIKKEI 225 for Japan, HEX for Finland, and OSEAX for Norway. Data for Japan only covers the period from 2004-2012 due to a lack of data.

				2002-2012				
		EP1*	**EP2***	**EP3***	**EP4***	**EP5***	**BM**	**Risk-free**
US	Return	6.0056	6.0244	7.3682	7.1650	6.4812	3.3464	1.8521
	Std.	24.5961	18.2066	16.0512	17.7593	21.9348	15.9882	0.5259
	Sharpe	0.1689	0.2292	0.3437	0.2992	0.2110	0.0935	
	Alpha	2.0176	2.5560	4.0712	3.7459	2.7978		
UK	Return	2.5955	6.0021	5.5511	4.3047	7.7887	2.7903	3.3957
	Std.	23.6196	18.3091	17.0421	17.4389	20.7144	15.2943	0.5819
	Sharpe	-0.0339	0.1424	0.1265	0.0521	0.2121	-0.0396	
	Alpha	-0.0496	3.2374	2.7430	1.5065	5.0244		
Japan	Return	1.1244	-0.5009	0.9433	-0.2876	0.2291	0.2110	0.2941
	Std.	23.3626	20.6886	20.1734	20.2595	23.1764	20.1553	0.0795
	Sharpe	0.0355	-0.0384	0.0322	-0.0287	-0.0028	-0.0041	
	Alpha	0.9187	-0.7136	0.7294	-0.5016	0.0252		
Finland	Return	3.4319	5.2958	6.0990	6.0372	12.1928	4.0454	2.3134
	Std.	23.4342	19.8606	16.7438	16.2535	19.4297	20.0831	0.3675
	Sharpe	0.0477	0.1502	0.2261	0.2291	0.5085	0.0862	
	Alpha	-0.6344	1.5574	2.5910	2.4872	8.4095		
Norway	Return	3.4636	2.7202	10.7352	10.1829	13.5041	13.0318	3.5138
	Std.	32.3438	25.7133	22.7611	18.4471	22.5638	23.2030	0.4986
	Sharpe	-0.0016	-0.0309	0.3173	0.3615	0.4428	0.4102	
	Alpha	-10.5620	-9.0103	-0.2482	0.4614	2.3726		

Table 6.22: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of randomized earnings yield portfolios across countries from 2012-2022

The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the randomized earnings yield portfolios from 2012-2022 across the five different countries. EP1* includes the constituents with the lowest randomized earnings yields, while EP5* consists of the constituents with the highest earnings yields. BM is the abbreviation for benchmark index and refers to the SPX index for the US, ASX for the UK, NIKKEI 225 for Japan, HEX for Finland, and OSEAX for Norway.

				2012-2022				
		EP1*	**EP2***	**EP3***	**EP4***	**EP5***	**BM**	**Risk-free**
US	Return	12.9070	13.1149	13.8249	12.6919	12.8707	12.6112	0.5908
	Std.	15.0422	14.3026	14.4953	16.3653	20.3940	13.2313	0.2279
	Sharpe	0.8188	0.8757	0.9130	0.7394	0.6021	0.9085	
	Alpha	-0.1331	0.1279	0.8128	-1.6137	-3.8834		
UK	Return	4.7924	7.7886	8.4918	7.8596	8.9640	4.0587	0.4358
	Std.	17.5563	13.8132	14.7283	14.8943	19.4400	12.0129	0.0617
	Sharpe	0.2482	0.5323	0.5470	0.4984	0.4387	0.3016	
	Alpha	-0.0126	3.8458	4.3088	3.6557	3.8332		
Japan	Return	14.6854	12.2183	10.8234	11.7810	9.1574	11.6471	-0.0073
	Std.	20.2257	17.6730	18.4955	19.7315	21.2186	17.1061	0.0258
	Sharpe	0.7264	0.6918	0.5856	0.5974	0.4319	0.6813	
	Alpha	2.2590	0.8708	-1.0032	-0.4412	-3.5402		
Finland	Return	4.6519	11.9734	11.2298	10.7955	12.0295	8.4716	-0.2324
	Std.	18.4744	17.6497	15.6487	16.2600	14.8327	14.9485	0.0798
	Sharpe	0.2644	0.6916	0.7325	0.6782	0.8267	0.5823	
	Alpha	-3.5013	4.1631	3.6926	3.1311	4.8744		
Norway	Return	4.0905	5.5087	11.9865	13.2166	8.7457	11.7169	1.0971
	Std.	27.8622	20.0954	17.1254	15.1232	19.8774	13.1504	0.1508
	Sharpe	0.1074	0.2195	0.6359	0.8014	0.3848	0.8076	
	Alpha	-14.3027	-7.4115	0.6584	2.9104	-4.5225		

6.2.4 Randomized market value and stock returns over time

In the 2002-2012 period, the outperformance of MV1* appears clear on both an absolute and risk-adjusted basis in all countries except the UK. In the 2012-2022 period, however, the outperformance of MV1* appears strongest in Finland and Norway, thus indicating a stronger effect in smaller capital markets. The smaller market value portfolios also outperform in the UK, albeit less than in Finland and Norway. Hence, we cannot suggest a difference between the performance across capital market sizes in the 2002-2012 period, but the difference appears more visible in the 2012-2022 period.

Table 6.23: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of randomized market value portfolios across countries from 2002-2012

The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the randomized market value portfolios from 2002-2012 across the five different countries. MV1* includes the constituents with the lowest randomized market values, while MV5* consists of the constituents with the highest randomized market values. BM is the abbreviation for benchmark index and refers to the SPX index for the US, ASX for the UK, NIKKEI 225 for Japan, HEX for Finland, and OSEAX for Norway. Data for Japan only covers the period from 2004-2012 due to a lack of data.

		2002-2012						
		MV1*	**MV2***	**MV3***	**MV4***	**MV5***	**BM**	**Risk-free**
US	Return	9.7191	7.4927	6.8077	5.3281	2.6400	3.3464	1.8521
	Std.	23.7479	20.1649	18.6043	17.2227	17.2483	15.9882	0.5259
	Sharpe	0.3313	0.2797	0.2664	0.2018	0.0457	0.0935	
	Alpha	5.8486	3.8657	3.2900	1.9155	-0.7964		
UK	Return	4.1517	5.5211	7.0584	4.5078	4.4463	2.7903	3.3957
	Std.	22.4450	19.0942	19.5577	20.1538	16.4230	15.2943	0.5819
	Sharpe	0.0337	0.1113	0.1873	0.0552	0.0640	-0.0396	
	Alpha	1.3703	2.7266	4.3315	1.8140	1.6693		
Japan	Return	4.2780	0.2567	0.9358	-2.6908	-1.4222	0.2110	0.2941
	Std.	23.8324	23.5190	19.3760	21.3554	18.6317	20.1553	0.0795
	Sharpe	0.1672	-0.0016	0.0331	-0.1398	-0.0921	-0.0041	
	Alpha	4.0763	0.0555	0.7184	-2.8991	-1.6423		
Finland	Return	12.0325	2.8212	6.1000	10.7697	3.5519	4.0454	2.3134
	Std.	18.5942	16.5545	19.5331	20.3115	21.9108	20.0831	0.3675
	Sharpe	0.5227	0.0307	0.1939	0.4163	0.0565	0.0862	
	Alpha	8.5586	-0.6966	2.3118	6.8827	-0.5683		
Norway	Return	11.4024	8.6614	8.4667	9.2599	5.3987	13.0318	3.5138
	Std.	23.2861	22.9452	24.7963	27.5550	27.1169	23.2030	0.4986
	Sharpe	0.3388	0.2243	0.1997	0.2085	0.0695	0.4102	
	Alpha	2.0372	-1.9732	-3.5226	-3.7497	-8.2296		

Table 6.24: Annualized average monthly returns, standard deviations, Sharpe ratios, and alphas of randomized market value portfolios across countries from 2012-2022

The table presents the annualized average monthly returns (%), standard deviations (%), Sharpe ratios, and alphas (%) of the randomized market value portfolios from 2012-2022 across the five different countries. MV1* includes the constituents with the lowest randomized market values, while MV5* consists of the constituents with the highest randomized market values. BM is the abbreviation for benchmark index and refers to the SPX index for the US, ASX for the UK, NIKKEI 225 for Japan, HEX for Finland, and OSEAX for Norway.

		2012-2022						
		MV1*	**MV2***	**MV3***	**MV4***	**MV5***	**BM**	**Risk-free**
US	Return	14.3524	12.4308	12.4692	12.7787	12.5756	12.6112	0.5908
	Std.	19.9018	16.3077	15.3383	14.3419	13.8211	13.2313	0.2279
	Sharpe	0.6915	0.7260	0.7744	0.8498	0.8671	0.9085	
	Alpha	-2.0098	-1.9404	-1.2651	-0.1688	-0.2242		
UK	Return	11.0933	9.4032	5.7310	6.3602	5.0012	4.0587	0.4358
	Std.	17.8665	16.9856	16.0040	15.4780	14.1996	12.0129	0.0617
	Sharpe	0.5965	0.5279	0.3309	0.3828	0.3215	0.3016	
	Alpha	6.5855	4.9798	1.2930	1.8486	0.5067		
Japan	Return	11.7753	12.9172	12.3827	10.1025	11.4208	11.6471	-0.0073
	Std.	22.0869	20.1575	18.7538	18.1196	17.4814	17.1061	0.0258
	Sharpe	0.5335	0.6412	0.6607	0.5579	0.6537	0.6813	
	Alpha	-1.4765	0.2850	0.5990	-1.5097	0.1561		
Finland	Return	15.8551	5.9383	13.2502	7.6983	7.1043	8.4716	-0.2324
	Std.	19.2622	16.4861	15.6673	15.6856	15.8036	14.9485	0.0798
	Sharpe	0.8352	0.3743	0.8606	0.5056	0.4642	0.5823	
	Alpha	8.1620	-1.6880	6.2349	0.0903	-1.2678		
Norway	Return	20.8521	8.9197	0.9504	4.4626	5.5254	11.7169	1.0971
	Std.	25.2273	20.8703	19.9992	19.1623	17.9218	13.1504	0.1508
	Sharpe	0.7831	0.3748	-0.0073	0.1756	0.2471	0.8076	
	Alpha	7.5495	-3.9736	-12.6086	-9.5454	-8.4789		

7.0 Conclusion

7.1 Conclusion

While the empirical findings in this paper show clear and significant earnings yield and size effects, we are unable to document overall clear differences in the relationship between earnings yield, size, and stock returns between small and large capital markets. This conclusion holds at least if we look at the entire 2002-2022 period, as we do identify some visible patterns of differences when splitting the sample. As such, the overall conclusion suggests that the lower efficiency characterizing smaller capital markets (Kennedy, 2004) is not reflected in the value and size factor premiums. In a practical setting, this implies that an investor cannot expect to earn higher risk-adjusted returns from investing in the earnings yield and size factors in small capital markets relative to large capital markets.

Starting with earnings yield, we identify a visible pattern of higher absolute and risk-adjusted returns of high earnings yield portfolios relative to low earnings yield portfolios in all countries except from Japan. The robustness check from randomizing the earnings yield portfolios, however, indicates a slightly less clear relationship. We also split the 2002-2022 sample period into two, namely 2002-2012 and 2012-2022, to map out any potential differences in the earnings yield effect over time. In the former period, we identify a clear outperformance of the highest earnings yield portfolios on both an absolute and risk-adjusted basis across all countries except Japan. In the latter period, the relative outperformance of the highest earnings yield portfolios disappears in all countries expect Finland. The results in both periods also hold when randomizing the portfolios on earnings yield. Despite this, we are not able to establish clear differences across capital market sizes over the entire sample period, but we note that the smaller capital markets appear to have outperformed slightly in the 2002-2012 period.

Moving on to size, we identify higher absolute and risk-adjusted returns of the lowest market value portfolios in all five countries. Despite bringing much higher volatility, the lower market value portfolios compensate with significantly higher returns. When checking for robustness by randomizing the market value portfolios, we broadly arrive at the same conclusions. However, the outperformance of small market value portfolios appears slightly stronger in the smaller capital markets of Finland and Norway compared to the larger capital markets. When splitting the sample period into the 2002-2012 and 2012-2022 periods, the size effect appears much stronger in the former period and less strong in the latter period. When randomizing on size, we identify a clear outperformance in all countries except the UK in the former period, while the outperformance in the latter period is dominated by the smaller capital markets. Again, however, we do not find overall clear evidence to suggest that the relationship is different between small and large capital markets over the entire 2002-2022 period.

7.2 Limitations and suggestions for further research

There are several limitations associated with our analysis, and we thus propose a few suggestions for future research. Firstly, time constraints have limited the scope of our data and analysis. Given that we had more time, it would have been beneficial to include more countries than the five used and to prolong the time period to further enhance the analysis. Secondly, in our analysis, we have focused primarily on highlighting the most important results rather than explaining potential underlying reasons behind the results. Thirdly, to make our analysis more realistic, a better alternative would likely be to also consider the transaction costs when rebalancing the portfolios. Additionally, the expected market impact could be factored in as well. Lastly, the stock prices we use are based on the last price for the day the stocks are traded, which may not necessarily be the exact price an investor would obtain due to market frictions.

8.0 Appendix

8.1 Indexed stock returns across countries from 2002-2022

8.1.1 The UK

Exhibit 8.1A: Indexed returns of ASX earnings yield portfolios vs. benchmark index and risk-free rate from 2002-2022

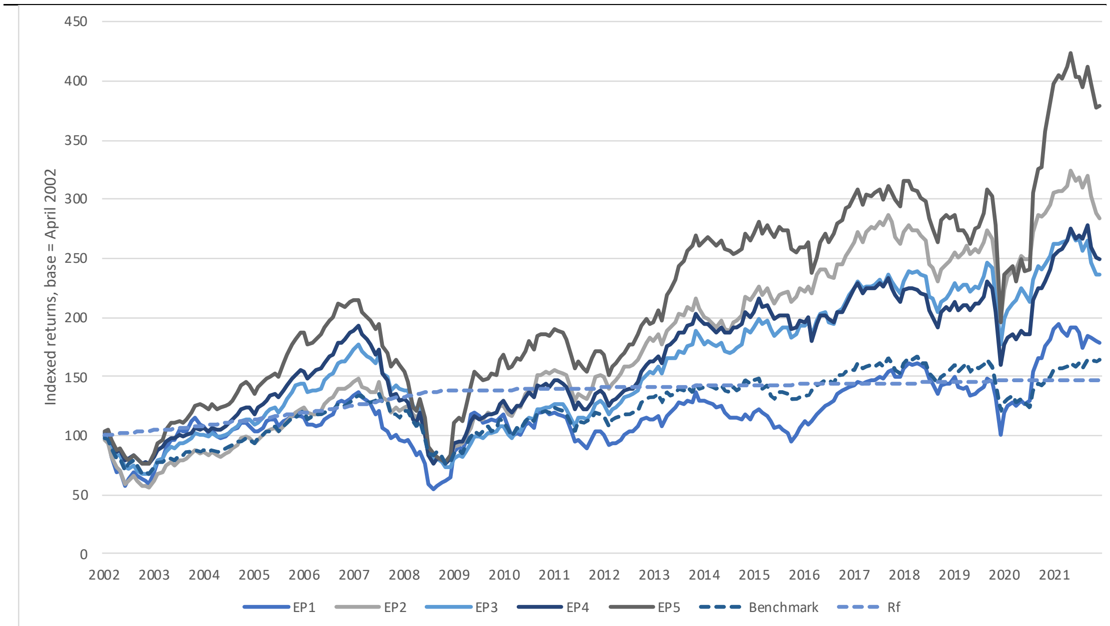


Exhibit 8.2A: Indexed returns of ASX market value portfolios vs. benchmark index and risk-free rate from 2002-2022

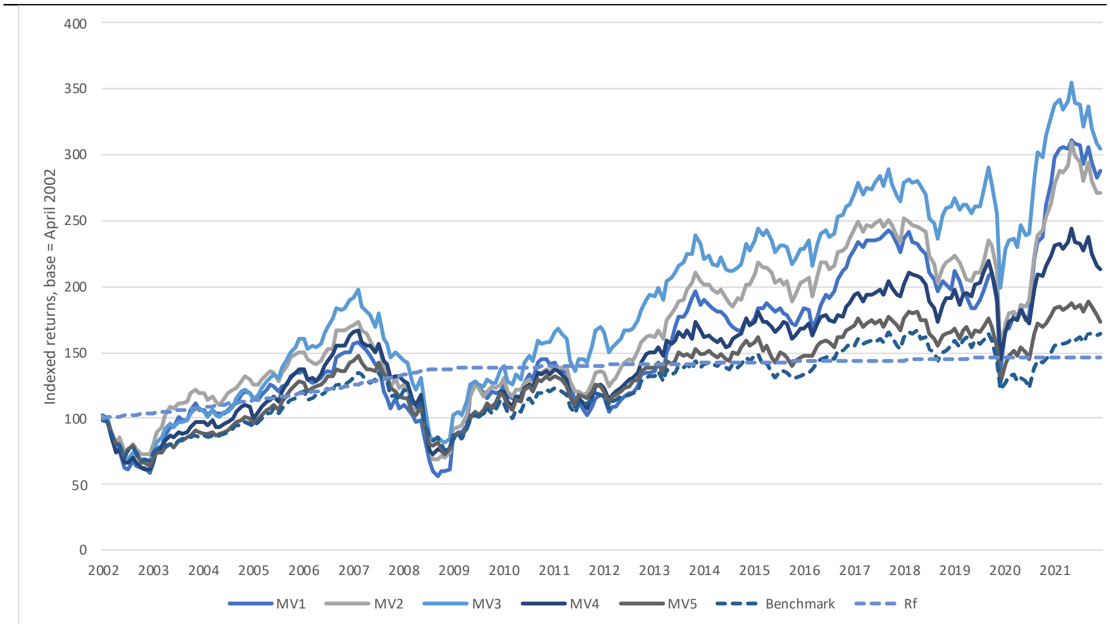


Exhibit 8.3A: Indexed returns of ASX randomized earnings yield portfolios vs. benchmark index and risk-free rate from 2002-2022

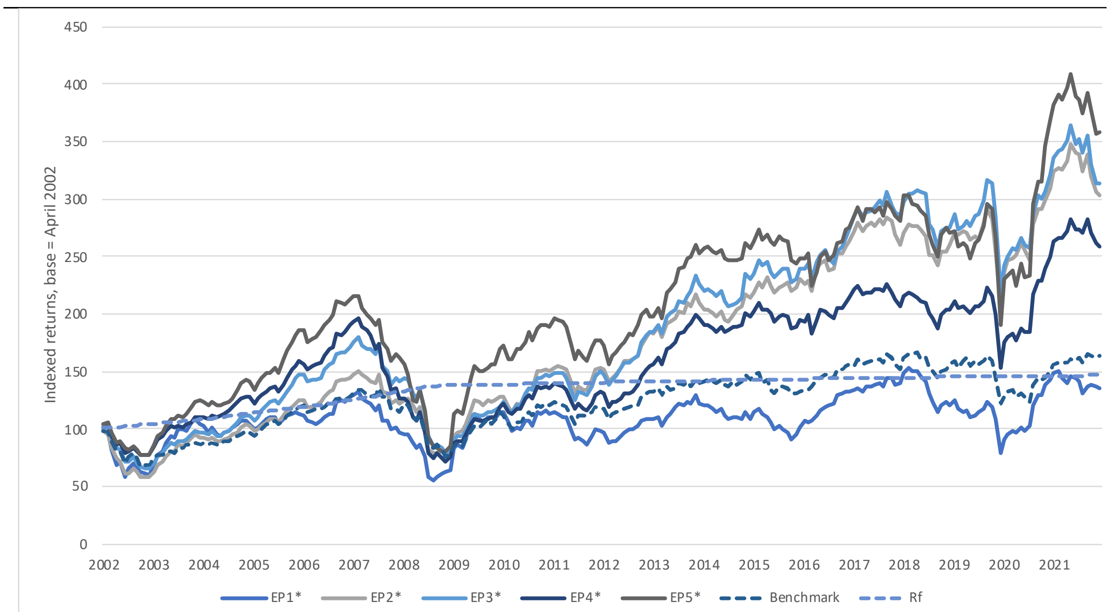
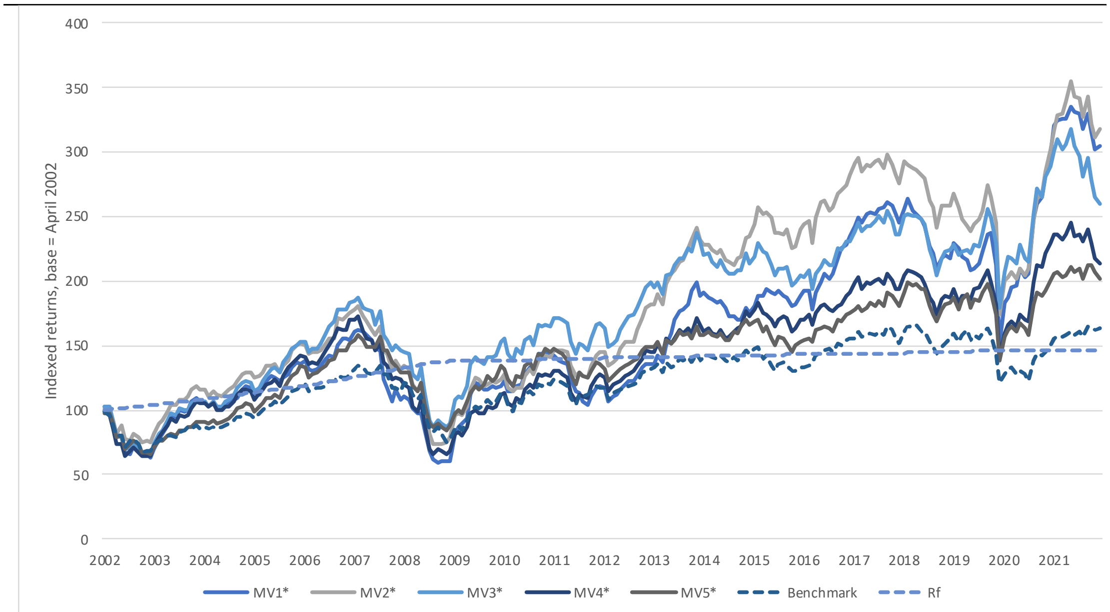


Exhibit 8.4A: Indexed returns of ASX randomized market value portfolios vs. benchmark index and risk-free rate from 2002-2022



8.1.2 Japan

Exhibit 8.5A: Indexed returns of Nikkei earnings yield portfolios vs. benchmark index and risk-free rate from 2004-2022

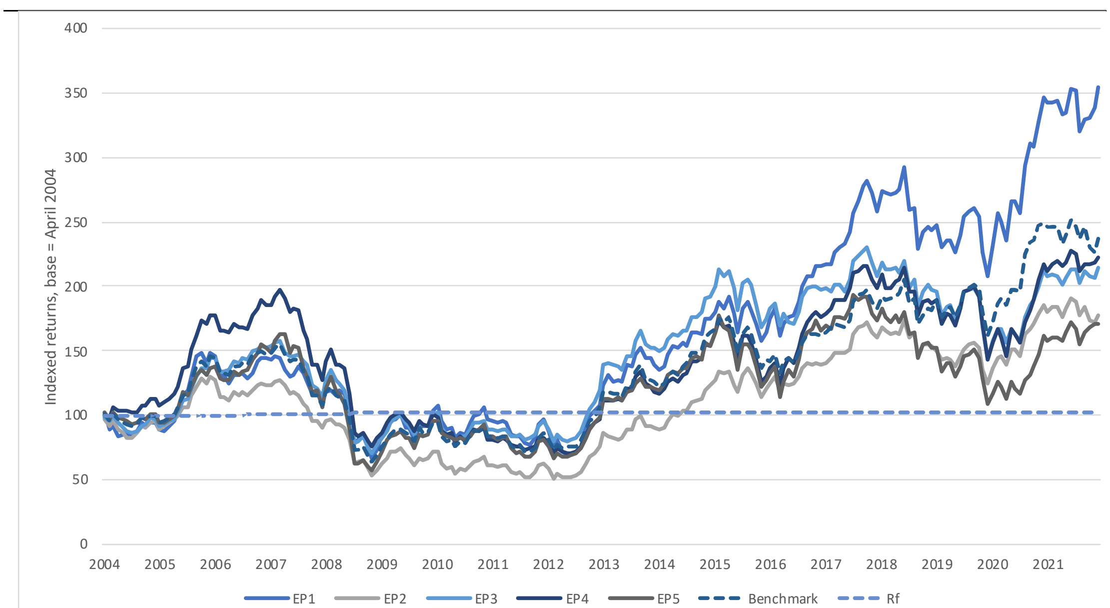


Exhibit 8.6A: Indexed returns of Nikkei market value portfolios vs. benchmark index and risk-free rate from 2004-2022

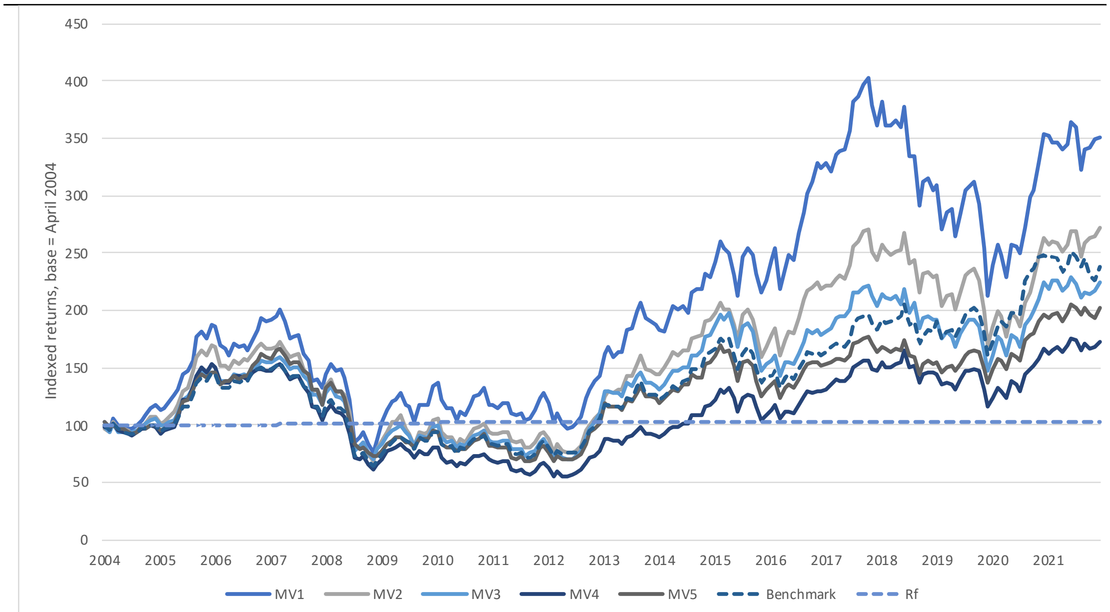


Exhibit 8.7A: Indexed returns of Nikkei randomized earnings yield portfolios vs. benchmark index and risk-free rate from 2004-2022

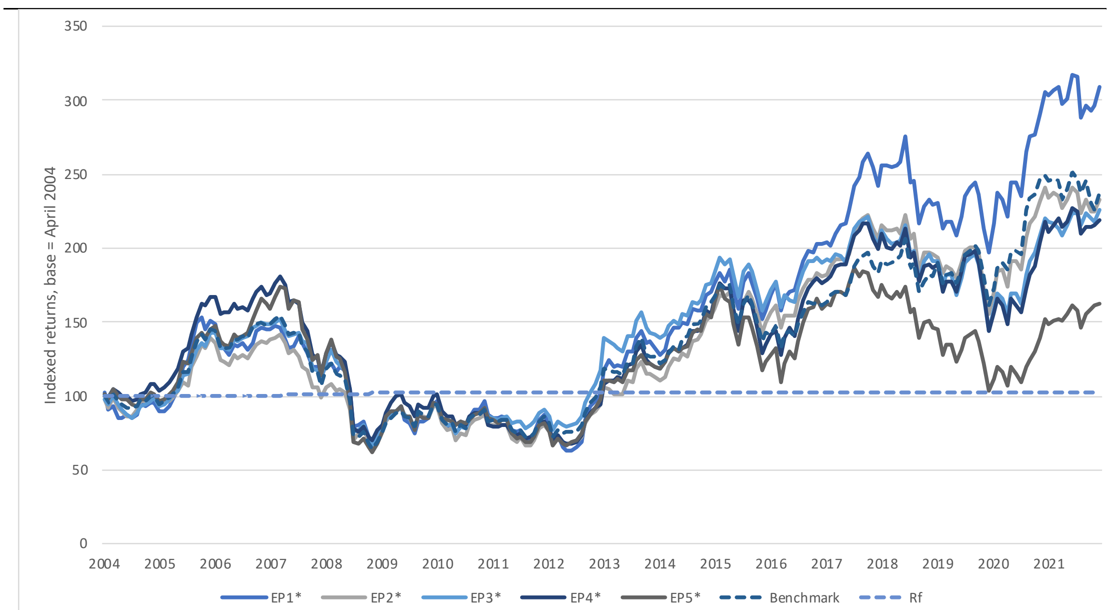
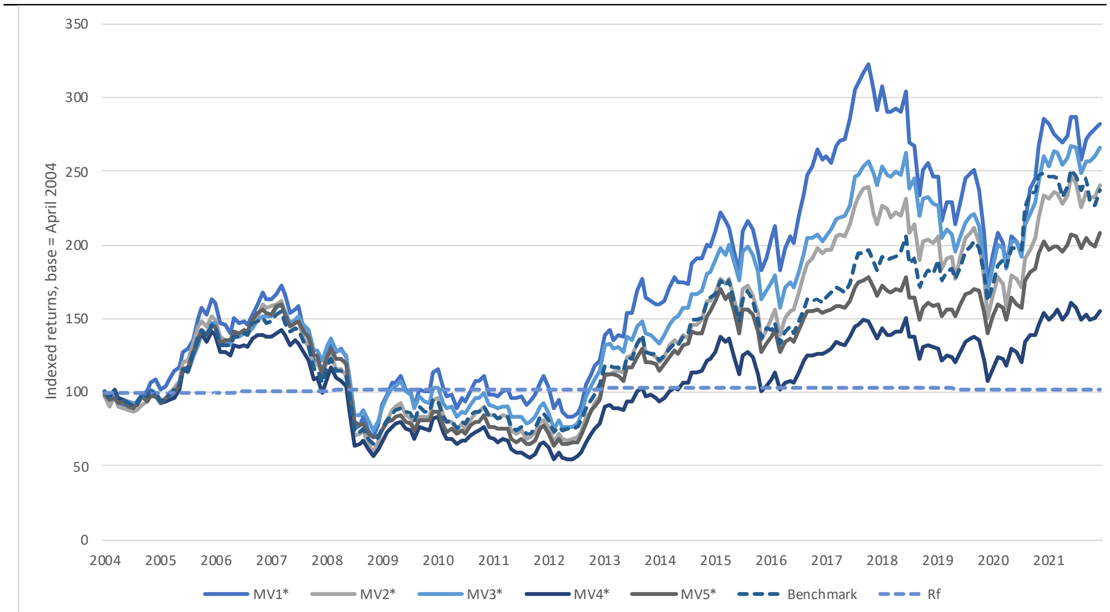


Exhibit 8.8A: Indexed returns of Nikkei randomized market value portfolios vs. benchmark index and risk-free rate from 2004-2022



8.1.3 Finland

Exhibit 8.9A: Indexed returns of HEX earnings yield portfolios vs. benchmark index and risk-free rate from 2002-2022

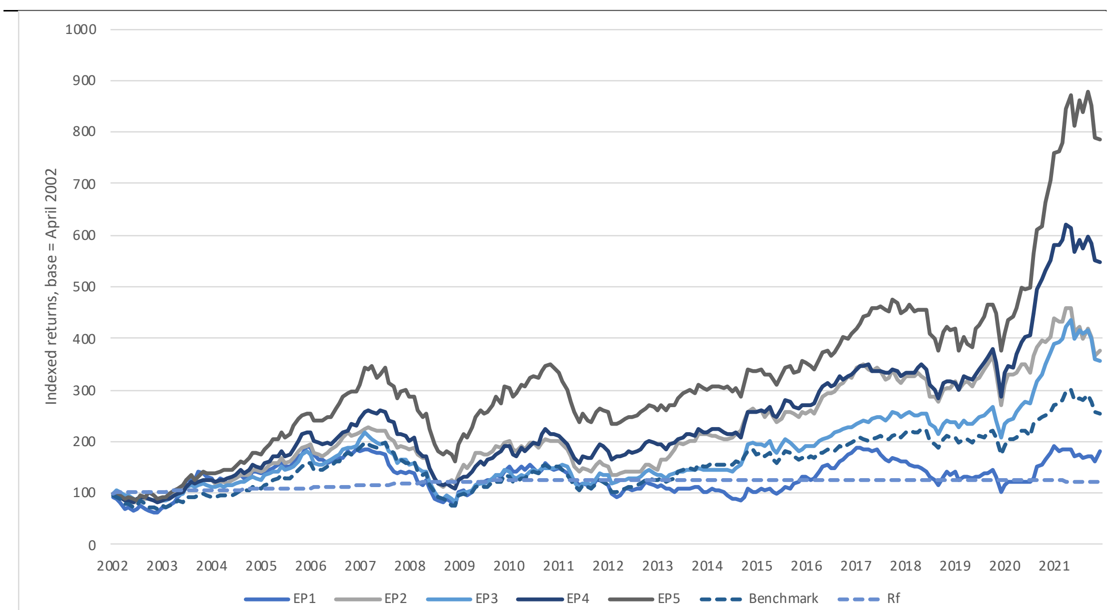


Exhibit 8.10A: Indexed returns of HEX market value portfolios vs. benchmark index and risk-free rate HEX from 2002-2022

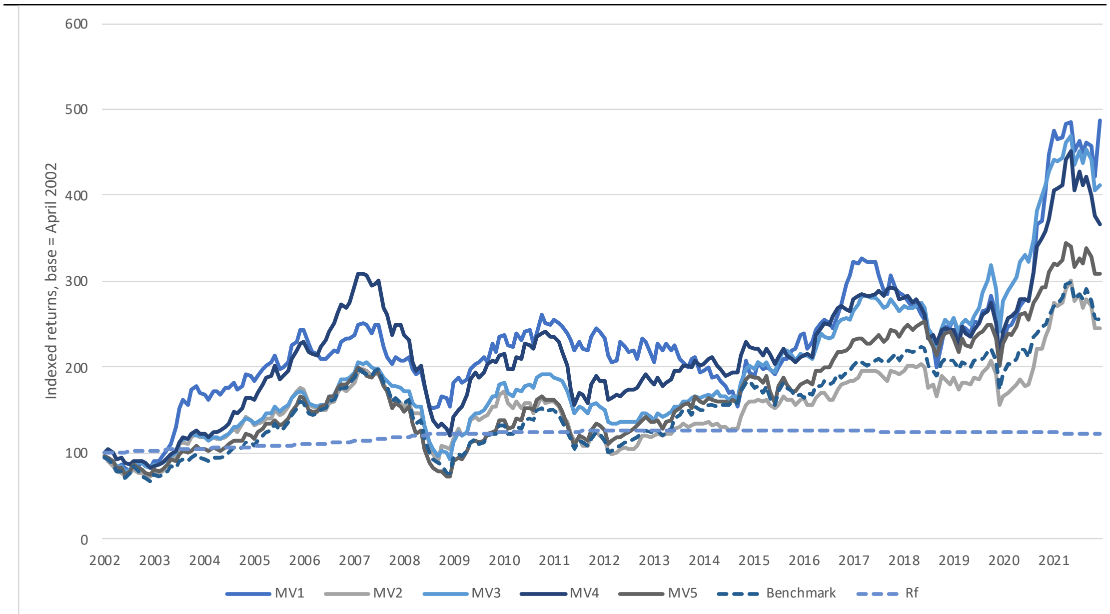


Exhibit 8.11A: Indexed returns of HEX randomized earnings yield portfolios vs. benchmark index and risk-free rate from 2002-2022

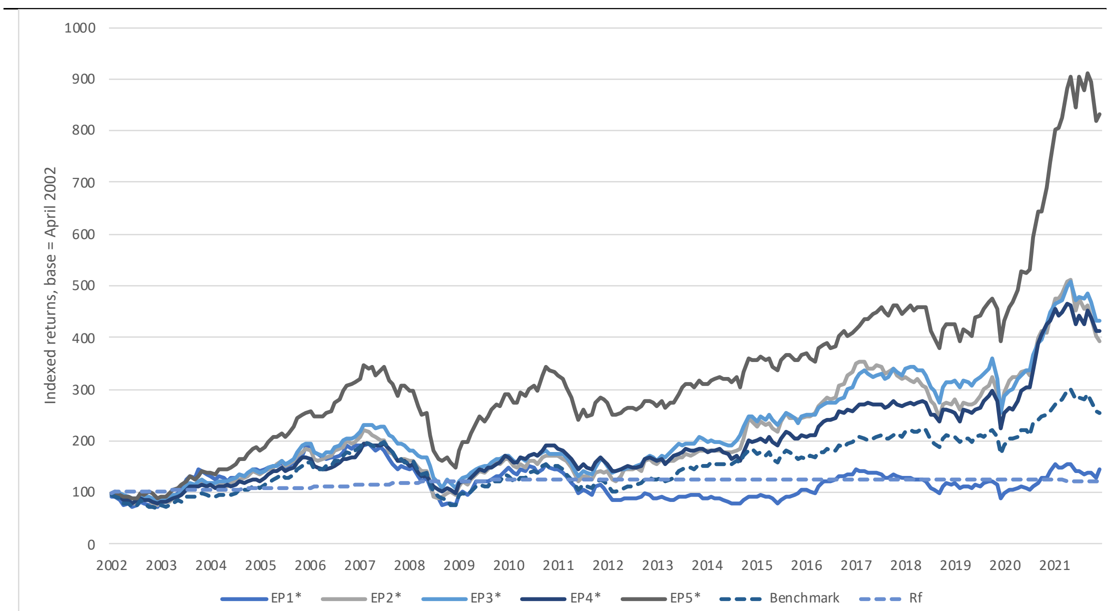
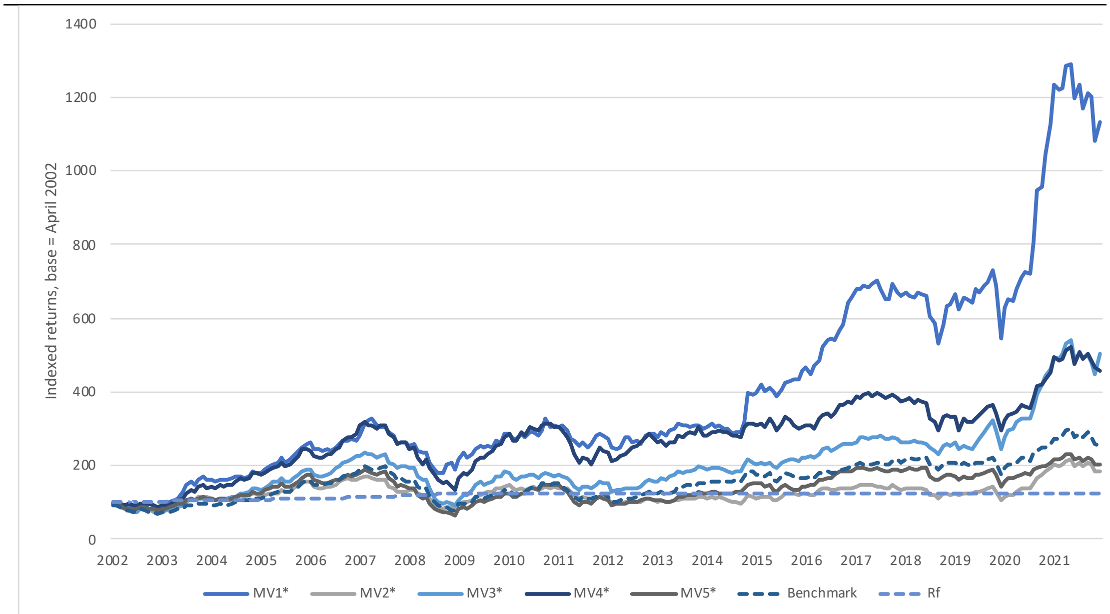


Exhibit 8.12A: Indexed returns of HEX randomized market value portfolios vs. benchmark index and risk-free rate from 2002-2022



8.1.4 Norway

Exhibit 8.13A: Indexed returns of OSEAX earnings yield portfolios vs. benchmark index and risk-free rate from 2002-2022

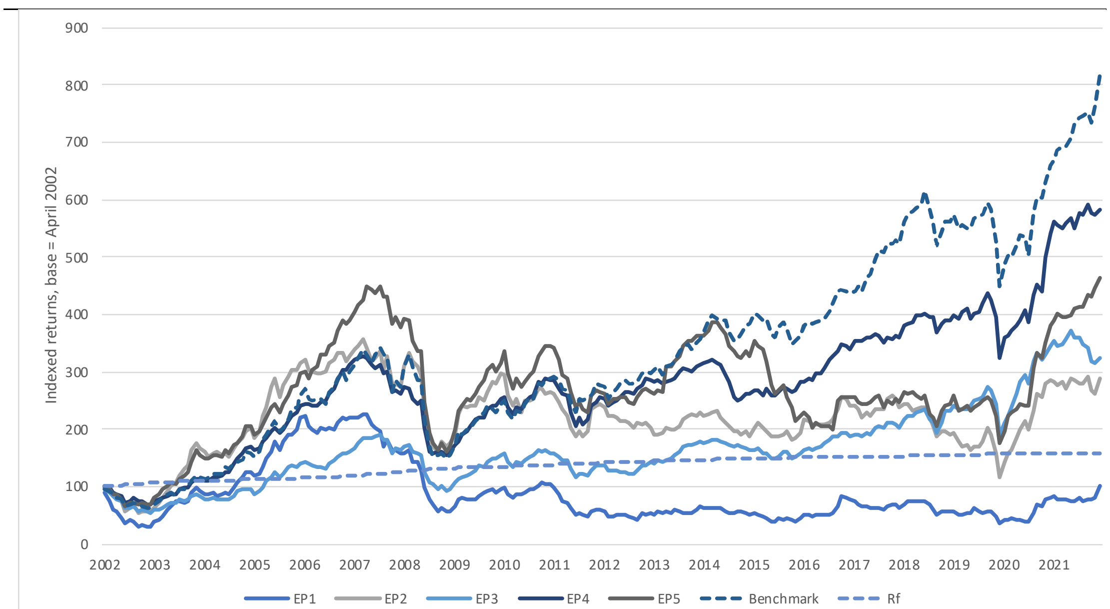


Exhibit 8.14A: Indexed returns of OSEAX market value portfolios vs. benchmark index and risk-free rate from 2002-2022

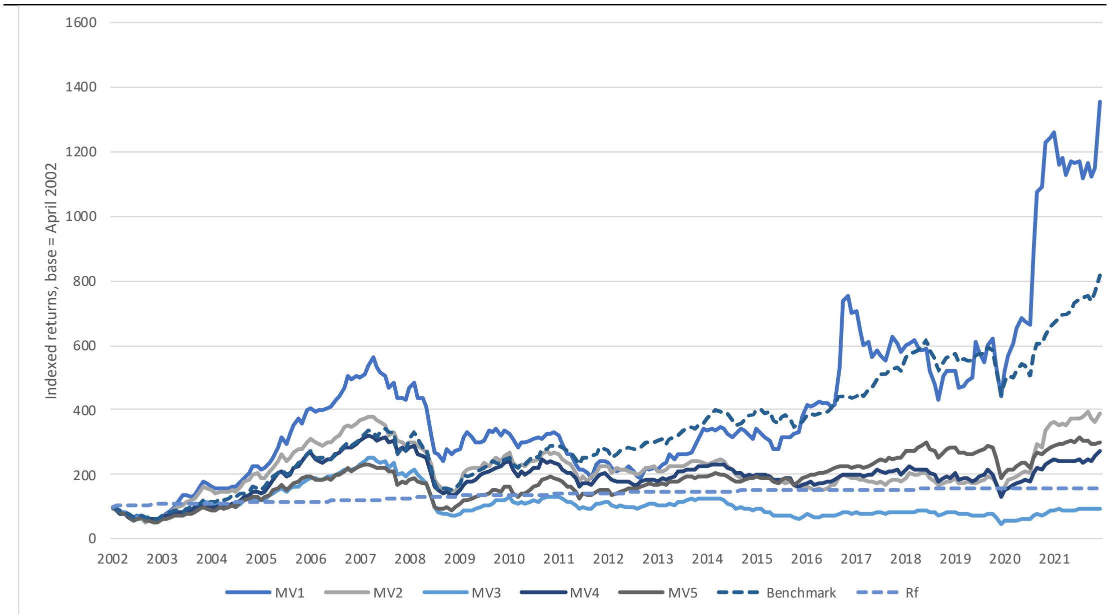


Exhibit 8.15A: Indexed returns of OSEAX randomized earnings yield portfolios vs. benchmark index and risk-free rate from 2002-2022

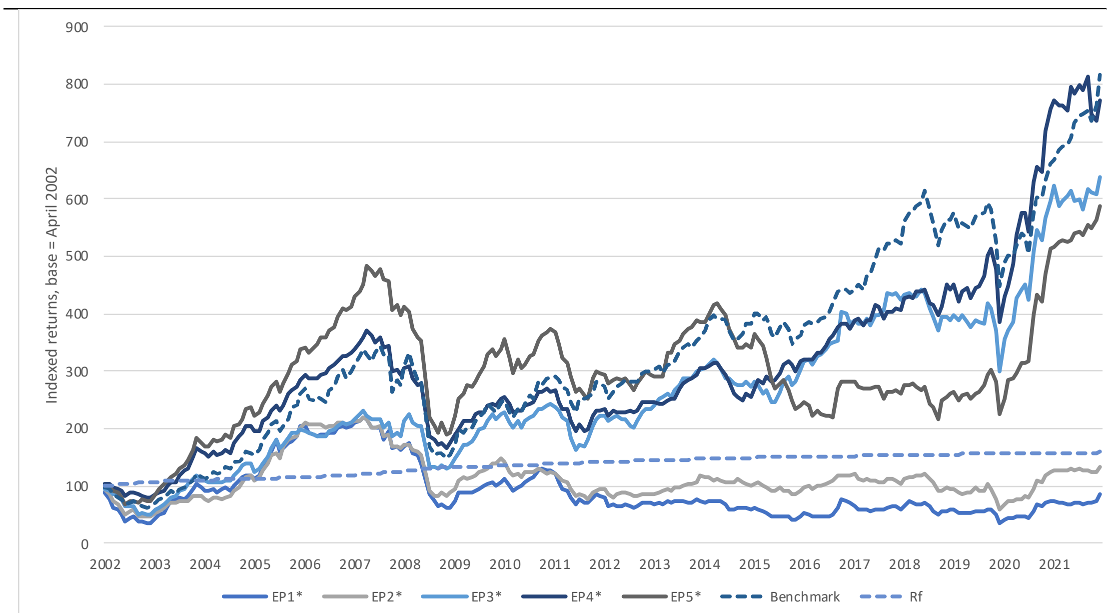
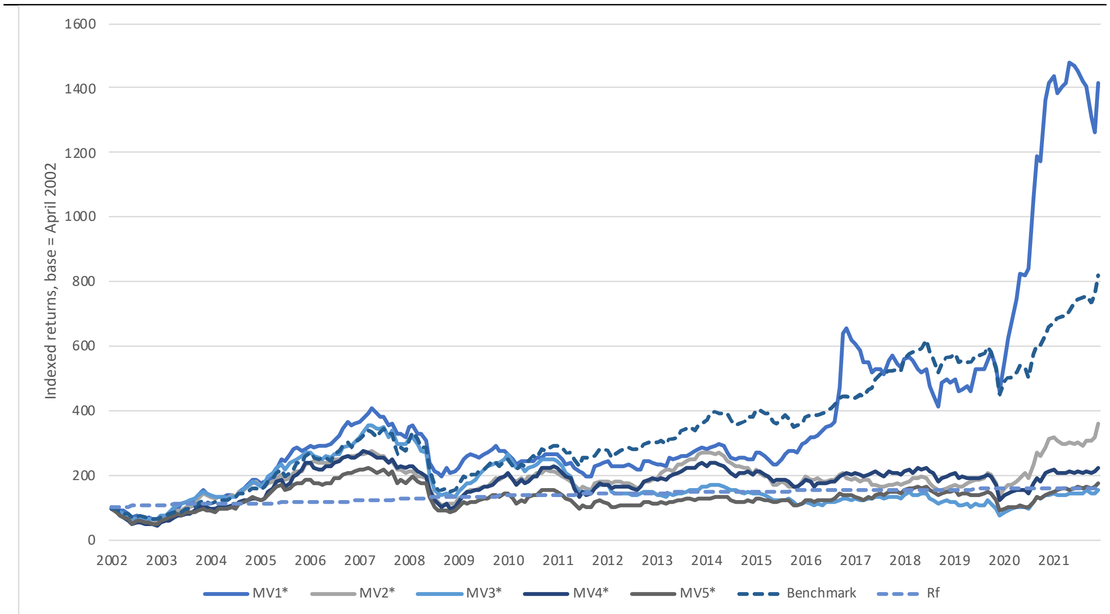


Exhibit 8.16A: Indexed returns of OSEAX randomized market value portfolios vs. benchmark index and risk-free rate from 2002-2022



8.2 Statistical significance tests of returns across countries from 2002-2012 and 2012-2022

Table 8.1A: Hypothesis tests of earnings yield portfolios across countries over time

The table presents the t-stats and critical values using a significance level of 5% for the five countries in two different periods: from 2002-2012 and from 2012-2022. The period for Japan is 2004-2012 and from 2012-2022 due to a lack of data. We reject the null hypothesis (the absolute returns of the highest earnings yield portfolios are not statistically higher than the absolute returns of the lowest earnings yield portfolios and the benchmark indices) if the t-stat is higher than the critical value. We reject the null hypothesis if the p-value is below the significance level.

		2002-2012		2012-2022	
		EP5 vs. EP1	**EP5 vs. BM**	**EP5 vs. EP1**	**EP5 vs. BM**
US	t-stat	0.2652	1.0746	0.5042	0.3483
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.3956	0.1424	0.3075	0.3641
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null
UK	t-stat	1.1104	1.0906	0.9764	1.5290
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.1345	0.1388	0.1654	0.0645
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null
Japan	t-stat	-0.5024	0.0494	-1.7274	-0.6048
	Critical value (5%)	1.6611	1.6611	1.6578	1.6578
	p-value	0.3083	0.4803	0.0433	0.2732
	Conclusion	Do not reject the null	Do not reject the null	Reject the null	Do not reject the null
Finland	t-stat	1.2869	2.0847	1.3169	1.4303
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.1003	0.0196	0.0952	0.0776
	Conclusion	Do not reject the null	Reject the null	Do not reject the null	Do not reject the null
Norway	t-stat	2.0854	-0.0637	-0.3260	-0.8731
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.0196	0.4747	0.3725	0.1922
	Conclusion	Reject the null	Do not reject the null	Do not reject the null	Do not reject the null

Table 8.2A: Hypothesis tests of market value portfolios across countries over time

The table presents the t-stats and critical values using a significance level of 5% for the five countries in two different periods: from 2002-2012 and from 2012-2022. The period for Japan is 2004-2012 and from 2012-2022 due to a lack of data. We reject the null hypothesis (the absolute returns of the lowest market value portfolios are not statistically higher than the absolute returns of the highest market value portfolios and the benchmark indices) if the t-stat is higher than the critical value. We reject the null hypothesis if the p-value is below the significance level.

		2002-2012		2012-2022	
		MV1 vs. MV5	**MV1 vs. BM**	**MV1 vs. MV5**	**MV1 vs. BM**
US	t-stat	2.0577	1.8378	0.6290	0.5662
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.0209	0.0343	0.2653	0.2862
	Conclusion	Reject the null	Reject the null	Do not reject the null	Do not reject the null
UK	t-stat	0.1537	0.2891	1.8155	1.6382
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.4390	0.3865	0.0360	0.0520
	Conclusion	Do not reject the null	Do not reject the null	Reject the null	Do not reject the null
Japan	t-stat	1.5938	1.9305	0.6359	0.2813
	Critical value (5%)	1.6611	1.6611	1.6578	1.6578
	p-value	0.0571	0.0283	0.2630	0.3895
	Conclusion	Do not reject the null	Reject the null	Do not reject the null	Do not reject the null
Finland	t-stat	1.1844	1.4145	0.4757	0.1762
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.1193	0.0799	0.4757	0.4302
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null
Norway	t-stat	0.8372	-0.0543	1.7017	1.2596
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.2021	0.4784	0.0457	0.1051
	Conclusion	Do not reject the null	Do not reject the null	Reject the null	Do not reject the null

Table 8.3A: Hypothesis tests of randomized earnings yield portfolios across countries over time

The table presents the t-stats and critical values using a significance level of 5% for the five countries in two different periods: from 2002-2012 and from 2012-2022. The period for Japan is 2004-2012 and from 2012-2022 due to a lack of data. We reject the null hypothesis (the absolute returns of the highest randomized earnings yield portfolios are not statistically higher than the absolute returns of the lowest randomized earnings yield portfolios and the benchmark indices) if the t-stat is higher than the critical value. We reject the null hypothesis if the p-value is below the significance level.

		2002-2012		2012-2022	
		EP5* vs. EP1*	**EP5* vs. BM**	**EP5* vs. EP1***	**EP5* vs. BM**
US	t-stat	0.1152	0.9442	-0.0109	0.0749
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.4542	0.1735	0.4957	0.4702
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null
UK	t-stat	1.4078	1.1944	1.3251	1.2743
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.0809	0.1173	0.0938	0.1025
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null
Japan	t-stat	-0.2081	0.0065	-1.7466	-0.7689
	Critical value (5%)	1.6611	1.6611	1.6578	1.6578
	p-value	0.4178	0.4974	0.0416	0.2218
	Conclusion	Do not reject the null	Do not reject the null	Reject the null	Do not reject the null
Finland	t-stat	2.0688	2.6262	2.1008	1.4048
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.0204	0.0049	0.0189	0.0813
	Conclusion	Reject the null	Reject the null	Reject the null	Do not reject the null
Norway	t-stat	1.8709	0.1096	0.8452	-0.7171
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.0319	0.4565	0.1999	0.2374
	Conclusion	Reject the null	Do not reject the null	Do not reject the null	Do not reject the null

Table 8.4A: Hypothesis tests of randomized market value portfolios across countries over time

The table presents the t-stats and critical values using a significance level of 5% for the five countries in two different periods: from 2002-2012 and from 2012-2022. The period for Japan is 2004-2012 and from 2012-2022 due to a lack of data. We reject the null hypothesis (the absolute returns of the lowest randomized market value portfolios are not statistically higher than the absolute returns of the highest randomized market value portfolios and the benchmark indices) if the t-stat is higher than the critical value. We reject the null hypothesis if the p-value is below the significance level.

		2002-2012		**2012-2022**	
		MV1* vs. MV5*	**MV1* vs. BM**	**MV1* vs. MV5***	**MV1* vs. BM**
US	t-stat	2.0208	1.7739	0.6021	0.5209
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.0228	0.0393	0.2741	0.3017
	Conclusion	Reject the null	Reject the null	Do not reject the null	Do not reject the null
UK	t-stat	-0.0594	0.2655	1.9841	1.8861
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.4764	0.3956	0.0248	0.0309
	Conclusion	Do not reject the null	Do not reject the null	Reject the null	Reject the null
Japan	t-stat	1.3997	1.3614	0.1185	0.0379
	Critical value (5%)	1.6611	1.6611	1.6578	1.6578
	p-value	0.0824	0.0883	0.4529	0.4849
	Conclusion	Do not reject the null	Do not reject the null	Do not reject the null	Do not reject the null
Finland	t-stat	1.7799	1.7487	1.9807	1.7049
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.0388	0.0415	0.0250	0.0454
	Conclusion	Reject the null	Reject the null	Reject the null	Reject the null
Norway	t-stat	0.9576	-0.2518	2.3517	1.4235
	Critical value (5%)	1.6578	1.6578	1.6578	1.6578
	p-value	0.1701	0.4008	0.0102	0.0786
	Conclusion	Do not reject the null	Do not reject the null	Reject the null	Do not reject the null

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