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Do All Stocks Fail to Outperform Treasury Bills?

An inquiry into the return distributions of individual stocks in United Kingdom, Japan, Germany, France, Italy and Sweden

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Abstract

In this paper, we investigate the distribution of individual stock returns in United Kingdom, Japan, Germany, France, Italy and Sweden from 1986 to 2017. Specifically, our results highlight the strong presence of positive skewness in the return distributions. Consequently, the majority of stocks fail to generate buy-and-hold returns superior to the matching one-month Treasury bills over their lifetime (or sample period). The only exceptions are Japan and France, where slightly more than half of the stocks yield positive excess return. Measured in wealth creation, only a fraction of companies constitute the total net wealth created in the market. The numbers range from 0.5% in Italy to 10.9% in Sweden, whereas the remaining stocks in aggregate have produced returns equal to the Treasury bills. Thus, it is evident that stock markets are highly concentrated, where contributions from the minority of stocks more than make up for the poor performance by the majority. The results provide evidence to why most undiversified funds underperform against market-wide benchmark portfolios.

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1 Introduction

It is well documented that stocks collectively, over the long term, generate returns superior to Treasury bills[1]. In fact, the magnitude of historical equity premiums still puzzle researchers (Mehra, 2003). If this is the case, the title of this paper may sound counter-intuitive. However, instead of analysing stocks collectively, the purpose of this thesis is rather to focus on a less disclosed dimension of stock returns – the return characteristics of *individual* stocks. By expanding the metrics beyond the measurement of mean and variance, we reveal the asymmetry that exists in long-term stock returns.

The paper is a replication and continuation of Hendrik Bessembinder's (2018) research on the US stock market, *Do Stock Outperform Treasury Bills?* The motivation behind our paper is to investigate whether his findings, that the majority of stocks fail to generate positive excess returns, applies for a broader market.

Because the purpose of the thesis is to continue the research initiated by Bessembinder, it will not necessarily present new theory on the topic. However, the intention is instead to provide further empirical evidence and insight on a rather undisclosed research area. The more insight we can gather on the global stock markets, the more investors and researchers can understand the return characteristics of stocks and the notion of the equity premium.

We have collected individual stock return data from the Compustat Global Daily database. The data set comprises six samples of monthly return observations on listed stocks in United Kingdom, Japan, Germany, France, Italy and Sweden from 1986 to 2017.

The six markets provide diversity with regards to market size, geography and economic conditions. This is purposely done to reflect a broad foundation when examining whether Bessembinder's findings apply to equity markets at a *universal* level.

Arguments in favor of supposedly universal distributional characteristics, point to globalization and the notion of a world economy. Increasing integration and geographical interdependency provide free flows of capital. Because of high capital mobility, any stock market difference will be arbitraged.

On the other hand, fundamental economic conditions are certainly not exempt from geographical borders. Stock prices mirror microeconomic factors and are therefore sensitive to domestic circumstances. The fact that there is not *one* key interest rate for all markets, creates an unequal basis as companies cannot borrow and lend at the same rate.

[1] Jeremy Siegel's book, *Stock for the Long Run* (1994), is just one example on the conducted research on the topic, where equity indices clearly outperform bonds.

Moreover, the risk-free proxy against which the markets are compared will consequently also differ.

The interaction between the two arguments opens for what inevitably is our research question: *Do all stocks fail to outperform Treasury bills?* We attempt to answer this question by conducting a series of comparative analyses as well as bootstrapping monthly buy-and-hold returns.

We find that the majority of stocks in all markets fail to outperform the matching Treasury bills at the monthly horizon. However, over the lifetime of each stock (or sample period), two markets stands out. The majority of stocks in Japan (51.7%) and France (51.2%) generate buy-and-hold returns[2] greater than the corresponding Treasury bills.

Measured in aggregated wealth creation[3], it becomes clear how concentrated the long-term return performance is. Just a minority of stocks actually account for all net wealth[4] created over the sample period. In fact, in Italy, only three companies (0.5%) account for all net wealth generated. The numbers range up to 10.9% in Sweden.

The rest of the paper is structured as follows. Section 2 presents an overview of the context and relevant literature, section 3 describes the data collection and treatment, section 4 presents the analysis and main results, section 5 discusses implications of the results, section 6 outlines limitations and further research, and lastly section 7 concludes.

[2]Including reinvestment of dividends

[3]Accumulated market value in excess of what would have been generated from solely investing the capital in one-month Treasury bills

[4]Wealth creation net of wealth destruction

2 Context

In this chapter we introduce the background and context which our research is based upon. First we will describe briefly Bessembinder's findings and its implications. In section 2.2 we will go through the driving factors behind equity premium as well as the motivation for active versus passive portfolio management. Finally, section 2.3 presents the concept of skewness in stock returns.

2.1 Do Stocks Outperform Treasury Bills?

Bessembinder's (2018) paper, *Do Stocks Outperform Treasury Bills?*, is the primary source of literature. To our knowledge, there is limited research on the topic of return characteristics of individual stock returns over longer periods. The fact that Bessembinder's paper was published in 2018 adds weight to that claim. We have adapted his methodology and drawn knowledge and inspiration to continue his research on additional markets.

The findings were, if not shocking, somewhat unexpected based on what we knew about stock markets[5]. Only a minority of the US stocks over the period from 1926 to 2016 outperformed the US Treasury bills. In fact, only 47.8% of the monthly stock returns were larger than the one-month Treasury rate in the same month. Further, over the full lifetime of the common stocks, just 42.6% had a lifetime buy-and-hold return greater than the return of one-month Treasury bills over the same period.

Bessembinder also calculated the aggregated wealth created by each individual company in the data set[6]. He saw that the 90 top-performing companies (0.35%) made over half of the wealth creation in the US stock market. Moreover, the 1,092 top-performing companies (4.3%) stood for all net wealth created in the US stock market.

The median life of a common stock in the US stock market was slightly over seven years, and the 90^{th} percentile lifespan was just over 27 years. Therefore, to see how individual stocks performed over the full 90 years, Bessembinder conducted a bootstrap simulation. The results showed that most single-stock portfolios performed poorly. Only 27.6% of single-stock strategies had greater return than one-month Treasury bills. Compared to the value weighted market portfolio, only 3.8% of single-stock strategies produced a larger return.

[5]Dimson et al. (2017) found that the US stock market provides long-term returns that exceed the return of government bonds and other low risk investments

[6]Bessembinder's data set was provided by The Center for Research in Security Prices (CRSP)

Expanding the Research to the Norwegian Stock Market

The two students, Jørund Norang and Fridrik Røssland Agustsson (2018), at the Norwegian School of Economics, expanded Bessembinder´s original study to the Norwegian stock market in their master thesis, *Do Norwegian Individual Stocks Outperform Government Bills?* They concluded that Bessembinder's findings were present in the Norwegian stock market as well. The similarities where striking. The majority of Norwegian individual stocks underperformed Treasury bills over their lifetime, or sample period (1985-2017). Only 42.9% of the stocks did. The paper reveals useful insight to the Norwegian stock market and provides an additional comparable benchmark to our findings. To our knowledge, the two studies are the only papers on the subject to date.

2.2 Portfolio Theory

One of the fundamental questions in finance is how the risk associated with an asset should affect its expected return. Numerous theories and models have been constructed with the sole purpose of best explaining this relationship. The disagreement is continuous, both in practical and theoretical terms. At the epicenter of discussion is how to measure the risk of an investment and how to convert the risk measure into an expected return that compensates for risk (Damodaran, 2018). Over time, theories have evolved from not only covering the pricing of risky assets, but to construct portfolio strategies based on asset composition and management. In the following section we introduce fundamental theories regarding asset pricing, equity premium and portfolio management.

2.2.1 Individual Stock Returns & Equity Premium

The primary purpose of this paper is inevitably to assess the returns of risky equity in relation to risk-free Treasury bills. Consequently, theory on asset pricing constitutes the foundation of our rationale. The general textbook treatment of asset pricing is based on *the present value model* (1). In its simplicity, the model states that the price of an asset should be the expected value of the net cash flows, discounted by the appropriate cost of capital (Fama and French, 1996).

$$P_0 = \sum_{t=1}^{n} \frac{E[CF_t]}{(1+r)^t} \tag{1}$$

The logic behind the discount factor stems from the idea that an investor should be compensated for awaiting consumption today. In microeconomic terms: the investor's

optimal preference of consumption today and in the future is when the utility deficit of having 1 NOK less today equals the utility gain of having r more NOK in the future. It is this discount factor, r, which is the variable of interest. Or as Adam Smith coined it; *the ordinary rate of profit in the investor's neighborhood* (1776). The notion covers two key aspects. The first part, *the ordinary rate of profit*, can be understood as a base rate, e.g. a risk-free alternative. The latter part, *in the investors neighborhood*, implies a more relative aspect. In modern finance it may be reasonable to assume that *neighborhood* represents the asset class and risk exposure:

$$r = risk\text{-}free\ rate\ (rf) + risk\ premium\ (rp) \tag{2}$$

The intuition behind equation (2) is twofold; *i*) the assumption that an investor always has the alternative to invest in a risk-free asset, and *ii*) the investor should be compensated for any (undiversifiable) risk he is exposed to by holding the given asset. As a theoretical concept, the risk premium reflects the equilibrium price of asset risk. Hence, it is the excess return investors demand to hold aggregate risk, which in turn affects the prices of all risky investments (Damodaran, 2018). The logic is intuitive – the price of very risky assets should be bid adequately low, such that the future payoffs from the asset become relatively high compared to the price. This is a simple, but key insight in asset pricing. In fact, this is arguably the fundamental theory our thesis is based upon. Namely, that *risky* equities should yield a higher return than *risk-free* Treasury bills.

As mentioned, numerous asset pricing models exists today. However, we will only focus on the most common one in this section, as it fulfills the purpose of explicitly presenting the methodology of why stocks should have a higher ex ante return than Treasury bills. In 1964, the Capital Asset Pricing Model ($CAPM$) provided the first comprehensive framework to quantify the effects of risk on expected returns (Perold, 2004). Developed by William Sharpe (1964), Jack Treynor (1961), John Lintner (1965) and Jan Mossin (1966) throughout the early '60s, the model explicitly define why stocks should have a higher ex-ante return than Treasury bills. In short, the theorem states that for any asset, the higher its non-diversifiable risk is, the higher its expected return should be. The formula is presented below (eq. (3) and (4)). Non-diversifiable risk, or systemic risk, is the risk that cannot be eliminated by adding the asset to a diversified portfolio.

$$E[r_i] = E[r_f] + \beta_i(E[r_m] - E[r_f]) \tag{3}$$

Where,

$$\beta = \rho_{i,m} \times \frac{\sigma_i}{\sigma_m} \tag{4}$$

Where $E[r_f]$ is the expected risk-free return and $E[r_m]$ is the expected market return, such that $(E[r_m] - E[r_f])$ represents the risk premium of the overall (equity) market. The beta, which is multiplied with the market risk premium, offers several interesting implications. First, the beta says something about what the expected return does *not* depend on. In particular, the expected return of a risky asset does not depend on its stand-alone risk. It might be implied that a high beta asset tends to have a high stand-alone risk because the beta makes up a portion of the stand-alone risk. However, an asset does not need to have a high beta to have a high stand-alone risk. Secondly, the beta offers a method of measuring the risk of an asset that cannot be diversified away (Perold, 2004). This is an important insight, which Cochrane (2004) put neatly: *It is not actually return volatility alone that matters, but rather the covariance with consumption growth. That is, the asset must pay a risk premium if the returns are bad in "bad times".*

Note that the $CAPM$ relies on a simplified and idealized world, with strong assumptions (e.g. no transaction costs, information is free and available to everyone etc.) that might not hold in the real world (Perold, 2004).

To investigate the empirical solidity of the *CAPM*, Banz (1981) examined the empirical relationship between the return and the total market value of NYSE common stocks. His study found that the small NYSE firms had significantly larger risk adjusted returns than large NYSE firms over a forty-year period. This size effect proves that the $CAPM$ is misspecified. Further, the size effect was not linear with the market value and not longitudinally stable through time. The main effect occurred for very small firms. Between average sized and large firms the differences in return were minimal. These findings emphasize the fact that it is unknown whether size itself is responsible for the effect or whether the size is just a proxy for an unknown factor which is correlated with the size of the firm.

The equity premium puzzle (Mehra and Prescott, 1985) has become a well-known phenomenon. The term was first brought to light by Rajnish Mehra and Edward C. Prescott in their study, *The Equity Premium: A Puzzle*, published in 1985. They studied the average premium of a well-diversified US equity portfolio over the US Treasury bills for more than 100 years[7]. Mehra and Prescott saw that the intuitive notion that stocks are riskier than bonds, was not sufficient enough to explain the difference between the return from stocks and bonds. The equity premium was approximately 6.4% on average between 1802 and 2000 in the US. The puzzle Mehra and Prescott found was that the premium's large percentage implied an incredibly high level of risk aversion among investors.

[7]The study was updated by Mehra (2003)

The US stock market has grown substantially over the last century, and to assess whether the equity premium existed outside the US market as well, Elroy Dimson, Paul Marsh and Mike Staunton extended the study by examining equities, bonds and Treasury bills in 16 different countries from 1900 to 2002 (Dimson et al., 2002). They showed that the equity risk premium for the 16 countries had been lower than previous research indicated, especially compared to the US. Even though their findings revealed lower returns, the main conclusion was still the same. Stocks clearly outperformed bonds and Treasury bills in terms of returns over the long horizon. With their findings they exhibited that the equity premium puzzle was still present at a global level.

2.2.2 Portfolio Management

The art of investing has developed into a scientific craft. The numerous investing strategies are still growing at a steady pace, all backed by mutual fund managers claiming the same; providing higher returns to their shareholders compared to benchmarks. How they manage to do this is twofold; *i*) by actively selecting securities that provide a superior risk-return trade-off, or *ii*) by observing and reviewing their portfolios in regards to the current market conditions (Shukla, 2004). Actively managed portfolios are often expensive and only benefit the shareholders if the excess return is sufficiently high to cover the management fees. Findings from this thesis could hopefully contribute to the continuous debate on the effectiveness of active portfolio management. We therefore find it relevant to include some basic theory on the area.

Let r_a^r and r_p^r be the reported return of respectively the actively managed mutual fund and the passively managed portfolio, net of management expenses and transaction costs. r_a^p and r_p^p are the gross portfolio returns. The excess return to the shareholders of the actively managed portfolio is the excess return on the actively held portfolio over the passive portfolio less the extra expenses charged for reviewing and monitoring the fund. Hence the benefit of interim revision:

$$Net\ benefit\ active\ portfolio = r_a^r - r_p^r \cong (r_a^p - r_p^p) - (e_a - e_p) \tag{5}$$

Where e_a and e_b are the expense ratios of the active and passive funds during the holding period (Shukla, 2004). The expense ratio includes management fees, administrative fees and transaction costs associated with buying and selling securities (Securities and Commission, n.d.). However, we assume there are no transaction costs associated with the passive portfolio. Because a passive portfolio in many cases can be an index fund, it is a

reasonable assumption[8]. The excess return for the active portfolio can thus be expressed by equation (6).

$$Excess\ return = r_a^r + e_a - \sum_{i=1}^{n} \omega_i r_i \tag{6}$$

Where $\omega_i\ r_i$ is the weighted return of asset i in the passively managed benchmark portfolio. Note that the benchmarks which mutual funds are compared against can change depending on the investment styles and strategies. Inevitably, whether an actively managed mutual fund is profitable for an investor, depends solely on its excess return being sufficiently high to cover the management fees.

It has been proven that active fund managers often underperform stock indices, or passive fund management (S&P Dow Jones Indices, 2018). David L. Ikenberry, Richard L. Shockley, and Kent L. Womack tried to find out the reason why in 1998, with their paper, *Why active fund managers often underperform the S&P 500*. They revealed that at least two factors can explain the underperformance (Ikenberry et al., 1998). Firstly, the size premium from year to year is an important factor. The premium that small-capitalization stocks earn is not stable over time, and in some years the large-capitalization stocks outperform the small stocks. This occurred in the mid-1990s and caused most active fund managers to perform poorly.

Secondly, they identified the impact of skewness on the return performance for portfolios that contained a limited number of stocks. For investors who held a small number of stocks, cross-sectional skewness in stock returns tended to produce a drag on the returns. This drag represented another "cost", included fees etc., incurred by active fund managers who tried to outperform passive index funds/benchmarks. This was highly significant for portfolios that held 35 stocks or less. This negative impact on skewness decreased for funds that comprised more than 35 stocks, but the impact was still measurable for funds and portfolios with as many as 150 stocks.

Meir Statman's study (1987) also showed that active fund managers gain substantial diversification benefits from creating portfolios with a larger number of securities. Statman, Ikenberry, Shockley and Womack's studies all give reasons to encourage active fund managers to construct portfolios consisting of a large number of stocks, diversifying away any idiosyncratic risk.

[8]Wermers (2000) found that transaction costs for the Vanguard Index was 0.03% per year between 1990-1994 and further declining through the 1990s

2.3 Skewness

Skewness in long-term returns is an important input to why only a few stocks provide the value creation. In their paper, *Portfolio Efficiency Analysis in Three Moments: The Multi-Period Case*, Arditti and Levy (1977) compared the relationship between the first three moments of an asset's single-period return and the first three moments of its multiple-period returns. They discovered that the random returns over multiple periods typically impart positive skewness, even though the single-period returns were symmetric.

To assess whether skewness also was a phenomenon in the stock market, Pomchai Chunhachinda, Krishnan Dandapani, Shahid Hamid and Arun J. Prakash (1997) investigated the skewness further by assessing the returns from the world's 14 major stock markets from 1988 to 1993. They demonstrated that monthly returns were not normally distributed and that the correlation between these stock markets was stable during the time period. In their study, they saw that 11 of the 14 stock markets' monthly return distributions exhibited significant skewness.

More recently Fama and French (2017) looked into long-horizon returns for the US market. They used bootstrap simulations to study the distributions of US stock returns with a horizons up to 30 years. Their findings revealed that the value weighted market return had a skewness of 6.11 over the 30-year horizon. The results showed that skewness increased at longer horizons. Specifically, the tail of the distribution from the bootstrap simulations was further to the right than the log-normal distribution predicted, and the middle of the distribution was shifted to the left.

In his paper, Bessembinder (2018) documented that the majority of individual stocks underperformed one-month Treasury bills over their full lifetime and that relatively few stocks stood for the wealth creation made on the US the market. These results provide a new dimension compared to most asset pricing models. Asset pricing models primarily focus on mean return, while Bessembinder's findings highlight the importance of median return. The deviation between the positive mean return and negative median[9] return imply individual stock returns are substantially skewed.

[9]The results from Bessembinder's study revealed negative median return over the lifetime horizon

2.3.1 Skewness in Single- and Multi-Period Returns

We first outline single-period returns to better understand why the majority of excess stock returns can be negative. Consider that single-period excess returns, denoted R, are distributed log-normally, and assume that:

$$r \equiv \ln(1+R)\ N(\mu, \sigma^2) \tag{7}$$

Where μ denotes the mean and σ denotes standard deviation. Further, the expected or mean excess return is:

$$E(R) = e^{\mu+0.5\sigma^2} - 1 \tag{8}$$

The median excess return is:

$$Med(R) = e^{\mu} - 1 \tag{9}$$

This is less than the mean return for all $\sigma > 0$. There is no distinct skewness parameter for the log-normal distribution, and the skewness of simple returns is positive and depends solely on σ.

The mean excess log return μ can also be stated as:

$$\mu = \ln[1 + E(R)] - 0.5\sigma^2 \tag{10}$$

So, if μ is negative, then the median simple excess return is negative. Implying:

$$\sigma > 2 * \ln[1 + E(R)] \tag{11}$$

To define skewness for log-normal distribution we use the formula:

$$Skewness = \sqrt{e^{\sigma^2}} - 1(2 + e^{\sigma^2}) \tag{12}$$

By assuming log-normality, the findings imply that more than half of single period excess returns will be negative if the excess return variance is sufficiently large relative to the mean excess simple return (Bessembinder, 2018). Consider an example where a stock has an expected simple excess return of 0.8% per month. If we assume the log-normal

distribution applies, the stock will have a negative median excess monthly return if σ (monthly return standard deviation) exceeds 12.62%.

With a trivial example, we can further illustrate the skewness in multi-period returns. Consider a stock with a symmetric zero-mean binomial distribution. For the first period, the stock price increases or decreases by 20%, with the equal probability of 50%. At the second period, still assuming equal probability for each outcome, the returns will be 44% (probability of 25%), -4% (probability of 50%) or -36% (probability of 25%). The example illustrates how a two-period return distribution is positively skewed with a standardized skewness coefficient of 0.412. Interestingly, the probability of getting a negative return after two periods is 75% and the median return of -4% is less than the zero mean.

Skewness in single-period returns typically implies skewness in multi-period returns as well. To further investigate skewness in multi-period returns, Bessembinder ran simulations of independent draws from a log-normal distribution. The results showed that skewness of multi-period returns increase with the number of periods. Moreover, the return standard deviation, which determines skewness, is proportional to the square root of the numbers of elapsed periods. The results from Bessembinder's simulations can be found in Appendix A, Table A.1[10].

2.4 Continuing what Bessembinder Started

Bessembinder discovered something new and important about individual stocks on the US stock market. Most of them do not last very long, in fact only 7.5 years, and most of them fail to produce a return higher than the Treasury bills.

Our thesis initiate coverage on six additional markets. The motive behind the choice of markets was threefold. UK, Germany, France and Italy were chosen because they all represent major European economies. Results from these countries would therefore provide a valid proxy for the characteristics of the European stock market as a whole.

Similarly, Japan was chosen for its market size. Today, the Tokyo Stock Exchange serves as the world's third largest stock market, only trailing the two major US exchanges (World Federation of Exchanges, 2018). For that reason alone, Japan makes a fascinating case. Moreover, it would be interesting to reveal the possible impact from the extraordinary economic conditions the country has seen the last three decades. Since the asset price bubble burst in 1990, the national debt has been soaring, government bond rates

[10]The simulations do not consider the role of risk aversion, but are in line with the intuition obtained from Martin (2012) on risk-adjusted returns.

have turned negative and the stock market has yet to fully recover.

Sweden was chosen for more or less the opposite reason. Similar to Japan, the Swedish Treasury rate has been negative over the last years. However, the similarities end there. After a series of deregulations and tax reforms throughout the 80's, the Swedish stock market boomed (Edvinsson et al., 2014). On aggregate, the Stockholm Stock Exchange has been one of the highest yielding stock markets globally. The combination of low interest rates and surging stock markets might be positively reflected in the results.

The six markets provide diversity with regards to size, culture and politics. The findings will therefore contribute substantially to a broad and supplementing coverage. It will further provide more insight on the individual stock return distributions at a universal level.

3 Data

Retrieving data of sufficient quality is fundamental in order to get reliable results. A common drawback for most databases is inconsistency in data quality throughout the sample. After discussions with professor Bessembinder and the institutional library at NHH and several European business schools, the Compustat Global Daily database was considered to be the best source.

We have retrieved trading data on domestic stocks listed at the major exchanges in UK, Japan, Germany, France, Italy and Sweden. The samples mainly cover stocks listed on the main markets in the respective countries[11]. Despite the fact that all exchanges have existed for over 150 years, the limitations of the database restrict us to *only* 32 full years of observations. Thus, the six sample periods range from January 1986 until December 2017.

It is important to note that the data set from Compustat contains flaws and limitations. Specifically, there are missing return observations in all samples. Consequently, some of the results might not be entirely precise. That being said, we argue the magnitude of the sample content makes the missing observations negligible. For the same reason, we argue that the 32 years of return observations still are sufficient in order to provide insightful results on the area of interest.

In order to get comparable results, we have collected data on ordinary/common stocks. Moreover, it best represents the realistic ownership for an ordinary investor. In some cases, companies have issued more than one common stock, e.g. Volvo AB have both an A share and a B share listed on the Stockholm Stock Exchange. Our analyses have primarily treated them as two separate shares, the only exception being wealth creation calculations. This is in line with what has been done in previous research, for the sake of reflecting how much value each *company* has created.

We have used *SEDOL* codes as the security identifier. This was the only consistent identification code throughout the timespan regardless of name changes and relistings. Further Compustat's own *Global Company Key* (*GVKEY*) was used as company identifier. This

[11]Main markets include London Stock Exchange, Tokyo Stock Exchange, Frankfurt Stock Exchange, Euronext Paris, Milano Stock Exchange (Borsa Italiana) and Stockholm Stock Exchange (Nasdaq OMX Nordic). The Tokyo Stock Exchange sample covers stocks formerly listed on the JASDAQ and Osaka Securities Exchange after the three markets merged in 2013, forming the umbrella corporation, Japan Exchange Group. The German sample includes some stocks from the exchanges in Berlin, Munich, Stuttgart, Dusseldorf and Hamburg. The Swedish sample covers some stocks from First North and Nordic Growth Market.

enabled us to categorize between stocks and companies. E.g. Volvo's A and B share has the same *GVKEY*, but different *SEDOL* codes.

Compustat Global daily does not provide returns directly, hence it had to be calculated manually (13). This was done in line with Compustat's own guidelines (Cumpustat, 2018), using the daily closing price (*PRCCD*), cumulative issue adjustment factor (*AJEXDI*) and the daily total return factor (*TRFDI*). The latter factor adjusts for cash equivalent distributions along with the reinvestment of dividends and the compounding effect of reinvested dividends.

$$Adjusted\ Return = \frac{\left(\frac{PRCCD_t}{AJEXDI_t}\right) TRFD_t}{\left(\frac{PRCCD_{t-1}}{AJEXDI_{t-1}}\right) TRFD_{t-1}} - 1 \tag{13}$$

As for the risk-free alternative, short term Treasury bills were the desired proxy to use. However, retrieving reliable return rates dating all the way back to 1986 on short term Treasury bills proved to be difficult. Consequently we found Datastream's one-month deposit rate to be the best alternative for Japan, Germany, France and Italy[12]. For the UK we used the one-month government bond yield[13]. The rates are provided in collaboration with Financial Times and Thomson Reuters. Regarding Sweden we used the one-month Treasury bill provided by Sveriges Riksbank[14]. For simplicity reasons we will refer to the Treasury bills when addressing the risk-free asset.

3.1 Data Treatment

The return samples on Germany, France and Italy presented a special case due to the currency transition to Euro in 1999. To reconcile for this, stock prices quoted in Mark, Franc and Lira were converted to Euro, using the official conversion rates.

A total of 238 stocks were removed from the six samples[15]. Of the removed stocks, 97% was removed due to only one valid price observation, and was therefore excluded as it restricted the calculation of returns.

Some stocks had lengthier gaps of missing observations. For instance one of Electrolux' stocks had no observations between October 1989 and January 1990. Whether it was due to illiquidity or flaws in the data set is difficult to assess. Obviously all gaps had to be

[12]Provided by Thomson Reuters and Financial Times (2018) through Datastream.

[13]Provided by Thomson Reuters (2018) Datastream.

[14]Provided by Sveriges Riksbank Sveriges Riksbank (2018).

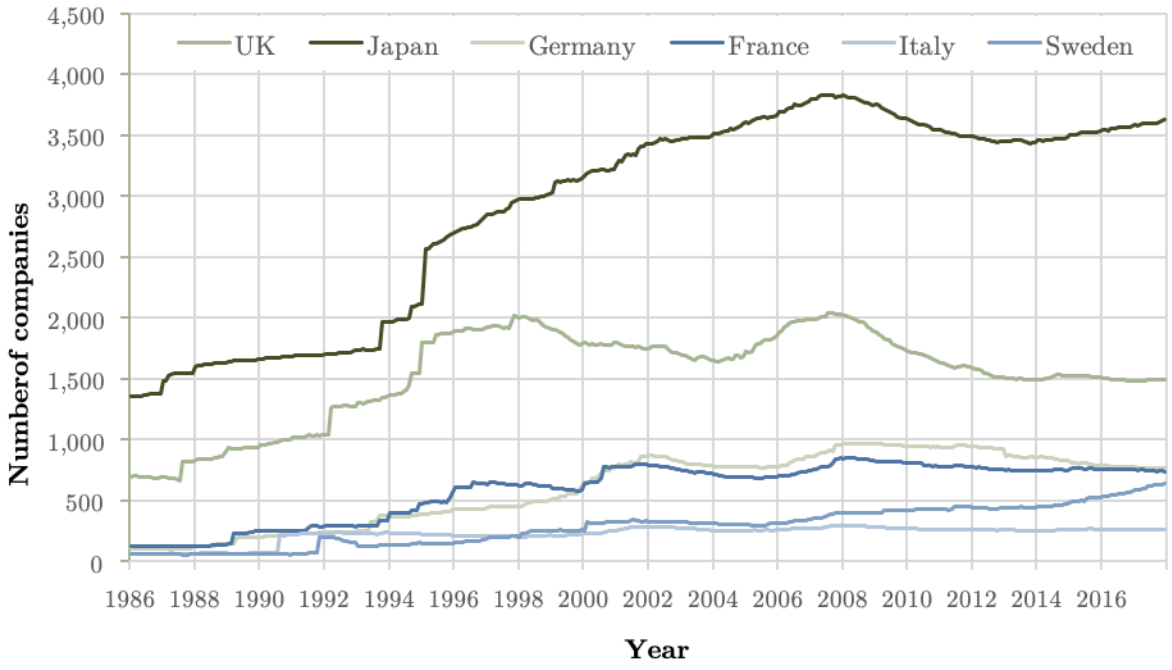
[15]Stocks removed: 93 from UK, 15 from Japan, 17 from Germany, 34 from France, 14 from Italy and 55 from Sweden.

treated equally. Without running the risk of falsely excluding illiquid stocks, we chose to fill all gaps with the last observable price. The same procedure was done for the number of outstanding shares.

To ensure we did not include severely flawed data, we created two exceptions. The first exception was if the gap after the first price observation was larger than 80 days. We then removed the first price observation, as we found it unlikely not having been traded the first 80 days after listing. The second exception was if there was a gap of more than 65 days between two price observations, and the number of outstanding shares had changed, while the stock price had not. We then removed the stock from the sample.

The six final samples comprise 4,805 stocks and 4,467 companies from UK, 5,242 stocks and 5,181 companies from Japan, 1,599 stocks and 1,523 companies from Germany, 1,833 stocks and 1,746 companies from France, 642 stocks and 616 companies from Italy and 1,235 stocks and 1,018 companies from Sweden.

Figure 3.1.1: Stocks in Compustat Database



1. The figure displays development in number of stocks in the (treated) Compustat database over the sample period

4 Analysis

4.1 Buy-and-Hold Returns at Various Horizons

In the following, we present the buy-and-hold return analysis for each data sample. First, the methodology is introduced. This is then applied on each market independently. The analysis is structured such that we first present the empirical findings and contrast across the markets and horizons. In the next section, we will interpret the results in the context of financial theory and economic reasoning.

4.1.1 Methodology

The analysis is conducted using monthly data variables for *Return*, *Market capitalization* (outstanding shares multiplied by share price) and *Treasury bills return.*

Buy-and-Hold Returns

Buy-and-hold returns are the returns generated by holding the stock and reinvesting the dividends. The returns are calculated over monthly, annual, decade and lifetime horizons. Annual returns are calculated over 32 calendar years, from January to December. Decade returns are non-overlapping 10-year periods, starting from 1986. This leaves three consecutive periods, ending in 2015. Lifetime returns are calculated from the beginning of the sample period or listing date until the end of the sample period or delisting date. It is worth mentioning that return intervals are shorter for stocks that are listed or delisted within a time period (annual or decade). These stocks are intentionally included as excluding them most likely would induce survivorship bias (Bessembinder, 2018)

The calculations of buy-and-hold returns are simply the compounded returns over a given interval, using the formula:

$$Buy\ and\ hold\ return_i = \prod_{j=1}^{n}(1 + r_j) - 1 \tag{14}$$

Here, i denotes the stock ($SEDOL$) in sample A, and j the j^{th} month in interval n.

The output from applying function (14) on each stock is a pool of returns. In the case of lifetime horizon, there will only be one return per stock. Monthly, annual and decade horizon will have several returns per stock, depending on the stocks' lifespan.

Specifically, the buy-and-hold return represents the yield an investor would generate by investing in a specific stock at the beginning of an interval or when the stock is listed. He then holds it until the end of the interval or until the stock is delisted. Any dividend received from holding the stock is assumed to be reinvested in the same stock. Further, we ignore any potential transaction costs, as the stock returns are the main aspect of interest.

Summary statistics

For all the return matrices, we calculate cross sectional statistics for each interval: arithmetic mean, median, standard deviation and skewness. A benefit from using these statistics is the ability to describe the return distributions in a simple and effective matter. Specifically, the goal is to portray in detail the distribution and its skewness. The skewness coefficient is calculated using the standard sample skewness formula:

$$Skewness = \frac{(\frac{1}{n})\sum_{i=1}^{n}(x_i - \bar{x})^3}{\left[\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2\right]^{\frac{3}{2}}} \tag{15}$$

Where x_i is the i^{th} buy-and-hold return, $\bar{x}$ is the mean buy-and-hold return and n is the number of observations.

Return benchmarks

Finally, the buy-and-hold returns are compared to three benchmarks; *i*) value weighted market return (VW), *ii*) equally weighted market return (EW) and *iii*) Treasury bills return.

The monthly EW return is simply the cross-sectional sample average return for each month:

$$EW_j = \frac{1}{n}\sum_{i=1}^{n} r_i \tag{16}$$

Where, $j = 1, 2, \ldots, 384$ is the month ranging from January 1986 until December 2017. Further, r_i is the i^{th} return observation in a total of n observations for a given month. The weight is recalculated for each month, adjusting for changes in n.

The monthly VW return is the cross sectional weighted average return of the sample, whose components are weighted according to the total value of their outstanding shares ($MCAP$):

$$VW_j = \sum_{i=1}^{n} w_i \times r_i \tag{17}$$

Where,

$$w_i = \frac{MCAP_{i,j-1}}{\sum_{i=1}^{n} MCAP_{i,j-1}} \tag{18}$$

Each return observation's corresponding weight, w_i, is the ingoing market value of its shares, $MCAP_{i,j-1}$, relative to the market value of all shares in the same month. Again, the weights are recalculated each month, adjusting for changes in relative market capitalization. MCAP-weighted portfolios are commonly used as benchmarks. In fact, most of the broadly used market indices today use this method (S&P500, NASDAQ Composite and OMX Stockholm 30). Intuitively, larger stocks have bigger impact on the returns with this method. A common argument for using this method is that the largest companies also have the largest shareholder bases, which make the case for having higher relevancy.

The raw data retrieved from Datastream and Sveriges Riksbank were initially annualized. The Treasury rates were therefore converted to monthly returns using the following formula:

$$Treasury\ bill\ return_j = (1 + y_j)^{\frac{1}{12}} - 1 \tag{19}$$

Where, y_j denotes the annualized Treasury yield in month $j = 1, 2, \ldots, 384$. Again, we have not considered transaction costs for the benchmark return calculations.

Finally, the benchmarks are matched to the corresponding month as the stock returns. Buy-and-hold returns for annual, decade and lifetime intervals are calculated for the benchmarks using the same formula as the stock returns (14). This enables us to compare the buy-and-hold return of the stocks against the three matching benchmarks.

4.1.2 Empirical Results

In the following, we conduct the buy-and-hold return analysis. Market returns are subdivided periodically and compared against corresponding benchmarks. The results are grouped by horizon, such that the geographies are collectively contrasted for each time interval.

Monthly Horizon

Table 4.1.1 displays summary statistics for monthly buy-and-hold returns. The statistics covers panel data from 1986 to 2017 for United Kingdom, Japan, Germany, France, Italy and Sweden.

Table 4.1.1: Buy-and-Hold Returns, Monthly Horizon

	Mean	**Median**	**SD**	**Skew**	**Mean**	**Median**	**SD**	**Skew**
	United Kingdom				***Japan***			
BaHR, T-Bill	0.004	0.004	0.003	0.570	0.001	0.000	0.002	2.296
BaHR, Stock	0.009	0.000	0.457	375.221	0.008	0.000	0.139	5.316
	Germany				***France***			
BaHR, T-Bill	0.002	0.002	0.002	0.800	0.002	0.002	0.002	1.056
BaHR, Stock	0.016	0.000	1.077	227.821	0.012	0.000	0.353	193.843
	Italy				***Sweden***			
BaHR, T-Bill	0.003	0.003	0.003	0.834	0.002	0.002	0.003	2.498
BaHR, Stock	0.004	-0.002	0.141	20.615	0.011	0.000	0.185	13.719

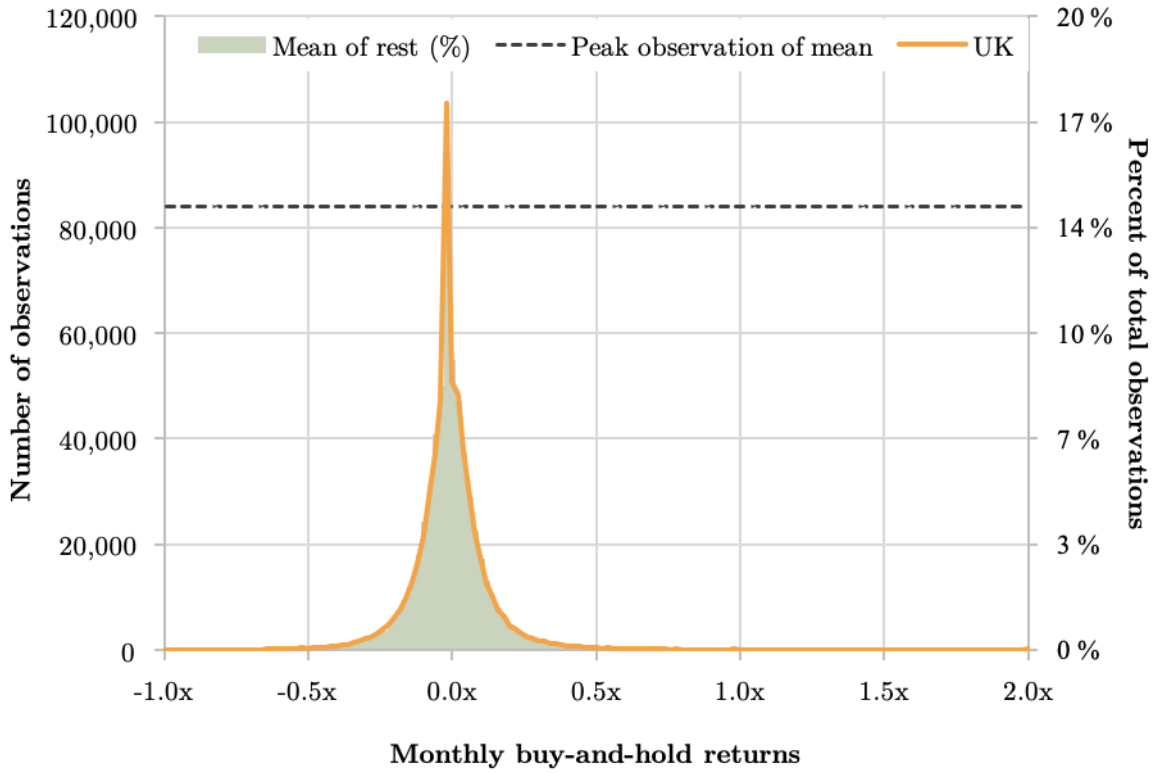
1. The table displays summary statistics for buy-and-hold returns from stocks and Treasury bills over the monthly horizon.
2. BaHR = Buy-and-Hold returns, SD = Standard deviation.

The average equity premium is positive in all markets, ranging from just 0.1% in Italy to 1.4% in Germany. Differences between the equity premiums are not solely caused by variations in stock returns. The Treasury bills deviate as well. Treasury bills in UK have on average yielded 400% higher returns than that of Japan. In fact, the Japanese Treasury bills has been negative for approximately 25% of the sample.

The *median* returns tell a rather different story. The median buy-and-hold stock return is approximately zero for all countries except Italy, where it is negative. These results are interesting in several ways. Firstly, the median equity premium is negative for *all* markets. Further, the majority of monthly buy-and-hold returns are negative in *all* markets.

Secondly, the fact that the median returns are lower than the mean imply positive skewness in the return distributions. This is confirmed by the positive skewness coefficients. Both standard deviation and skewness vary significantly between the markets. Conversely the frequency distributions (Appendix C: Figure C.1) are nearly equal for all markets, with a clear bell shape and slightly longer right tails. As to why these discrepancies arises are not all clear. One possible cause is that outliers are affecting the metrics.

Figure 4.1.1: Frequency Distribution of Returns, Monthly Horizon



1. Frequency distribution of British buy-and-hold returns and EW average of remaining markets (in %)
2. Returns are grouped by 2 percent with an overhead bin at >200%

Using UK as an example, it has by far the highest skewness coefficient of 375.2. However, when comparing its frequency distribution against the mean (Figure 4.1.1), there are no clear signs of strong dissimilarities. Notably, its min-max spread ranges from -99.8% to 24,900.0%. The max return is clearly higher than any other sample, and even surpasses its max return over the annual and decade horizon. When excluding the top two returning stocks from the sample, the skewness coefficient drops more than 200 points. Thus, it is evident that the skewness coefficient is rather sensitive to outliers. In section 4.1.3 we supply a more thorough discussion on alternative catalysts for skewness in stock returns. That being said, the topic is rather complex, thus further research would contribute substantially to a rather undisclosed peculiarity.

Table 4.1.2: Buy-and-Hold Returns vs. Benchmarks, Monthly Horizon

Country	**% > 0**	**% > T-Bill**	**% > VW Mkt. Return**	**% > EW Mkt. Return**
United Kingdom	46.2 %	45.1 %	45.7 %	45.4 %
Japan	48.0 %	48.3 %	46.8 %	44.5 %
Germany	45.9 %	46.0 %	45.6 %	42.1 %
France	47.0 %	47.0 %	46.4 %	43.8 %
Italy	46.7 %	45.3 %	45.7 %	45.9 %
Sweden	48.1 %	48.2 %	45.9%	45.9%

1. The table displays monthly buy-and-hold returns compared against various benchmarks.

2. T-bill = Treasury bill, VW Mkt. Return = Value weighted market portfolio return, EW Mkt. Return = Equally weighted market portfolio return.

Table 4.1.2 displays monthly buy-and-hold returns versus various market benchmarks. The statistics across the geographies are strikingly similar. Prevalent for all is the fact that the majority of stocks fail to outperform the corresponding Treasury bills. It is therefore not surprising that the majority of stocks fail to outperform the matching returns from the VW and EW market portfolios. As to why stocks *in aggregate* outperform the Treasury bills when most individual stocks underperform, lies in the distribution skewness. Explicitly, the extraordinary return performance of a minority of stocks, more than make up for the weak performance of the majority.

Annual Horizon

We continue the analysis by linking the monthly buy-and-hold returns over calendar years. The summary statistics are presented in Table 4.1.3.

Table 4.1.3: Buy-and-Hold Returns, Annual Horizon

	Mean	**Median**	**SD**	**Skew**	**Mean**	**Median**	**SD**	**Skew**
	United Kingdom				***Japan***			
BaHR, T-Bill	0.044	0.046	0.034	0.725	0.009	0.001	0.018	2.343
BaHR, Stock	0.127	0.045	1.117	61.672	0.110	0.017	0.673	14.308
	Germany				***France***			
BaHR, T-Bill	0.023	0.021	0.022	0.950	0.027	0.024	0.027	1.113
BaHR, Stock	0.104	0.014	1.391	57.191	0.128	0.046	1.386	86.893
	Italy				***Sweden***			
BaHR, T-Bill	0.040	0.029	0.040	0.923	0.024	0.017	0.031	1.779
BaHR, Stock	0.059	0.000	0.502	4.151	0.149	0.056	0.884	22.049

1. The table displays summary statistics for buy-and-hold returns from stocks and Treasury bills over the annual horizon.

Compounding buy-and-hold returns over multiple periods further disclose the dissimilarities between the market performances. The mean equity premiums range from just 1.9% in Italy to 12.5% in Sweden. Further, the median equity premium is negative for the countries on the left hand side, and positive for the right hand side.

Comparing the skewness with the findings from the monthly horizon discloses an inconsistent development. For UK, Germany, France and Italy, the skewness coefficient has dropped significantly, whereas it has increased for Japan and Sweden. Bessembinder (2018)[16] and Norang and Agustsson (2018)[17] also found the skewness to increase for US and Norwegian stocks.

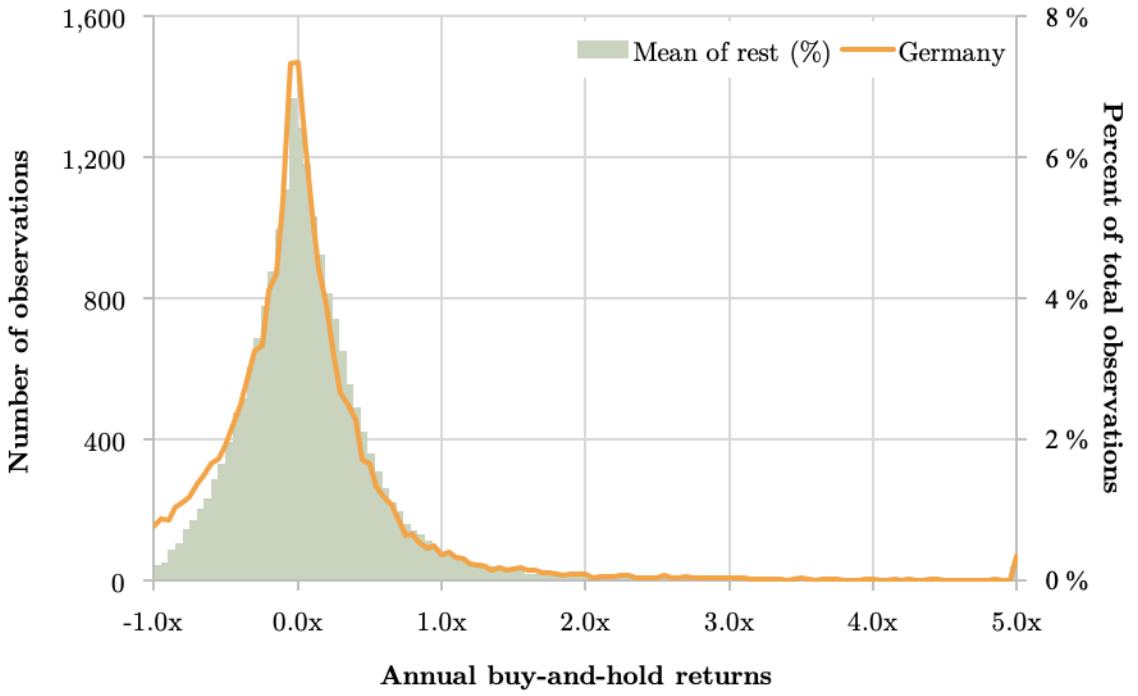
With reference to the theory on multi-period skewness in section 2.3, the compounding of normally distributed volatile returns should induce skewness. Conversely, we find that the skewness decrease for four out of six countries, when compounding monthly returns annually. It can, however, be pointed to the fact that these same four countries by

[16]Bessembinder found the skewness coefficient for US buy-and-hold returns increasing from 7.0 at monthly horizon to 19.8 at annual horizon (p. 44)

[17]Norang and Agustsson found the skewness coefficient for Norwegian buy-and-hold returns increasing from 6.5 at monthly horizon to 7.9 at annual horizon (p. 35)

far held the highest monthly skewness coefficients. Hence, the skewness spread is more concentrated compared to the monthly horizon. Because outliers may pollute the skewness coefficient, as was seen earlier, it is difficult to assess the stand-alone effect on skewness caused by compounding random returns. While the distributions from Sweden, Japan, US and Norway support the theory that compounding random returns induce skewness, our findings also suggest that the distribution development is more complex than that.

Figure 4.1.2: Frequency Distribution of Returns, Annual Horizon



1. Frequency distribution of German buy-and-hold returns and EW average of remaining markets (in %)
2. Returns are grouped by 5 percent with an overhead bin at >500%

The return frequency distributions are again relatively similar, despite the deviating skewness coefficients. The most frequent observation is -5%[18] in all markets except Japan and Germany where it is 0%[19]. Compared to the monthly horizon, the distribution is less concentrated with a longer right tail. Thus, the positive skewness is more prominent.

The majority of buy-and-hold returns are positive in all markets except Italy. Compared to the Treasury bills, the performances are somewhat split. In all markets, except Germany and Italy, the majority of stocks outperform the matching Treasury bills. That being said, the differences between the countries are small, apart from Italian stocks who tend to underperform on a relative and absolute basis. On the other hand, when evaluated

[18]The frequencies are grouped by 5%, thus the -5%-bin are all returns between -5% and 0%
[19]The frequencies are grouped by 5%, thus the 0%-bin are all returns between 0% and 5%

against the VW and EW market portfolios, the results are persistent – the majority of all stocks generate inferior buy-and-hold returns.

Table 4.1.4: Buy-and-Hold Returns vs. Benchmarks, Annual Horizon

Country	% > 0	% > T-Bill	% > VW Mkt. Return	% > EW Mkt. Return
United Kingdom	55.3 %	50.4 %	44.5 %	42.9 %
Japan	52.5 %	51.6 %	47.6 %	39.4 %
Germany	52.1 %	49.3 %	42.2 %	32.4 %
France	56.1 %	53.0 %	45.7 %	38.2 %
Italy	49.8 %	44.9 %	42.3 %	43.9 %
Sweden	55.7 %	53.4 %	44.4 %	42.9 %

1. The table displays annual buy-and-hold returns compared against various benchmarks.

Decade Horizon

Table 4.1.5 presents summary statistics for the decade horizon. The samples comprise three full decades: 1986-1995, 1996-2005 and 2006-2015. Stocks that list or delist within a decade are included to prevent survivorship bias.

Table 4.1.5: Buy-and-Hold Returns, Decade Horizon

	Mean	Median	SD	Skew	Mean	Median	SD	Skew
	United Kingdom				***Japan***			
BaHR, T-Bill	0.348	0.196	0.386	1.732	0.090	0.017	0.182	2.022
BaHR, Stock	0.695	0.128	2.700	15.145	0.426	0.000	4.275	72.469
	Germany				***France***			
BaHR, T-Bill	0.200	0.152	0.185	1.973	0.215	0.152	0.260	2.689
BaHR, Stock	0.494	-0.015	2.735	13.830	0.745	0.136	2.370	7.195
	Italy				***Sweden***			
BaHR, T-Bill	0.360	0.153	0.423	2.314	0.192	0.144	0.266	3.744
BaHR, Stock	0.546	-0.070	2.680	9.777	1.052	0.230	3.549	12.205

1. The table displays summary statistics for buy-and-hold returns from stocks and Treasury bills over the decade horizon.

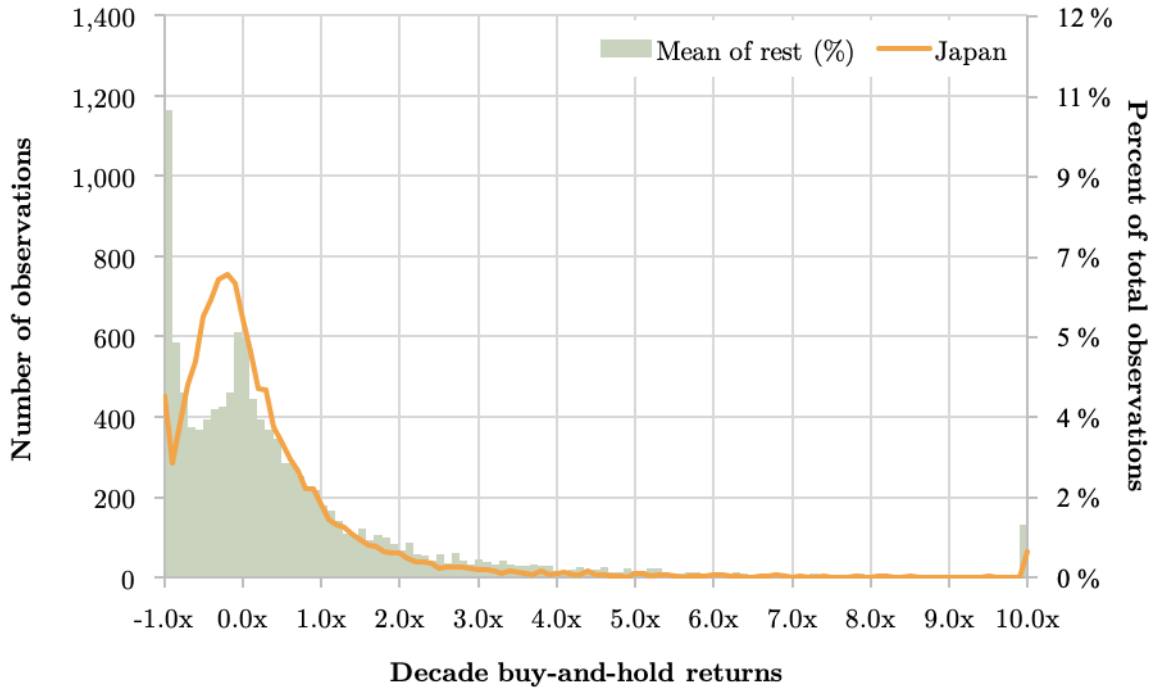
The summary statistics for decade horizon display similar properties as seen from the annual horizon. The mean equity premium continues to increase for all markets, now ranging from 19.6% in Italy to 86.0% in Sweden. The median equity premium on the other hand, is decreasing for all markets except Sweden.

Unexpectedly, the skewness coefficient is still decreasing for UK, Germany and France, despite increasing mean-median spread and standard deviation. Again, outliers are most likely still affecting the sample at the annual horizon. Noticeably, the skewness coefficient continues to cluster to more moderate levels. The only exception being Japan where the skewness has tripled. As it turns out, the metric is substantially affected by one single outlier, Yahoo Japan Corporation. The stock has generated buy-and-hold returns four times higher than the next best stock. Excluding this stock reduces the skewness coefficient to 16.9, which is a more moderate increase, as one would expect.

With reference to Table A.1 (Appendix A), the compounding of normally distributed volatile returns with a standard deviation of 20% should aggregate to a skewness coefficient of 53.3. However, five out of six markets are far below this. Again, it is evident that skewness characteristics in multi-period returns are complex. Thus, the assumptions from the simulations are not likely to hold at a stand-alone basis. However, for the sole purpose of disclosing the effects of compounding volatile returns, the contributions are of value.

A factor that could have impact on the skewness coefficient is the fact that we allow for stocks that are listed or delisted within a decade. This creates a trade-off. By avoiding survivorship bias one allows for incomplete decade return observations. Consequently, we could potentially compare a stock with one return observation against a stock compounded over 120 periods.

Figure 4.1.3: Frequency Distribution of Returns, Decade Horizon



1. Frequency distribution of Japanese buy-and-hold returns and EW average of remaining markets (in %)

2. Returns are grouped by 10 percent with an overhead bin at >1000%

The frequency distributions are now noticeably asymmetric. Comparing the distributions across the markets reveals dissimilarities. While -100%[20] is the most frequent distribution in all other markets than Japan, most Japanese stocks yield a return between -10% and -20% over the decade horizon. This is an interesting finding, revealing that despite performing inferior to the other markets, single-stock investors where still less likely to lose *all* their money in Japan.

[20]Rounded by 10%, such that -100%-bin include all returns less than -90%.

Table 4.1.6: Buy-and-Hold Returns vs. Benchmarks, Decade Horizon

Country	% > 0	% > T-Bill	% > VW Mkt. Return	% > EW Mkt. Return
United Kingdom	56.7 %	47.5 %	37.2 %	36.4 %
Japan	50.0 %	44.7 %	38.8 %	22.6 %
Germany	49.0 %	42.3 %	35.0 %	22.5 %
France	57.6 %	50.4 %	40.7 %	26.8 %
Italy	46.6 %	37.1 %	35.9 %	40.2 %
Sweden	59.3 %	53.6 %	40.1 %	37.0 %

1. The table displays decade buy-and-hold returns compared against various benchmarks.

Table 4.1.6 displays stock performance versus various benchmarks. Only in France and Sweden are the majority of stocks outperforming the matching Treasury bills. The fraction of stocks that beat the VW and EW portfolios are continuously declining. The decreasing trend in performance implies that active portfolio management, assuming no superior market knowledge, is less probable to succeed as the horizon increases.

Lifetime Horizon

Finally, in Table 4.1.7 we present return statistics for all stocks over their lifetime or sample period.

Table 4.1.7: Buy-and-Hold Returns, Lifetime Horizon

	Mean	Median	SD	Skew	Mean	Median	SD	Skew
	United Kingdom				***Japan***			
BaHR, T-Bill	0.793	0.325	1.029	1.788	0.196	0.030	0.256	0.793
BaHR, Stock	3.346	0.092	19.074	20.985	1.544	0.212	5.923	20.454
	Germany				***France***			
BaHR, T-Bill	0.403	0.279	0.468	1.722	0.408	0.236	0.536	2.393
BaHR, Stock	1.915	-0.109	8.276	10.062	2.747	0.250	9.066	5.737
	Italy				***Sweden***			
BaHR, T-Bill	0.775	0.343	0.981	1.710	0.270	0.093	0.514	3.787
BaHR, Stock	1.430	-0.055	7.699	12.058	4.025	0.090	18.047	9.554

1.The table displays summary statistics for buy-and-hold returns from stocks and Treasury bills over the lifetime horizon.

Despite seemingly attractive *mean* return characteristics, four out of six markets have negative *median* equity premium. The Swedish stock market is, on average, the most profitable market both in terms of stock returns and equity premium.

The top performing stock in any market measured in lifetime buy-and-hold return is Antofagasta plc, listed on London Stock Exchange with a return of 76,574%. The stock was active over the total sample period (384 months), which corresponds to an annualized return of 23%. Note that the stock was listed in 1888, thus its actual lifetime return most likely differs from the one calculated in the sample.

Japan is arguably the most interesting case, where the stock market, measured in mean equity premium, is the second worst performing market. However, measured in median equity premium, it is clearly at the top with 18.3%.

Table 4.1.8: Buy-and-Hold Returns vs. Benchmarks, Lifetime Horizon

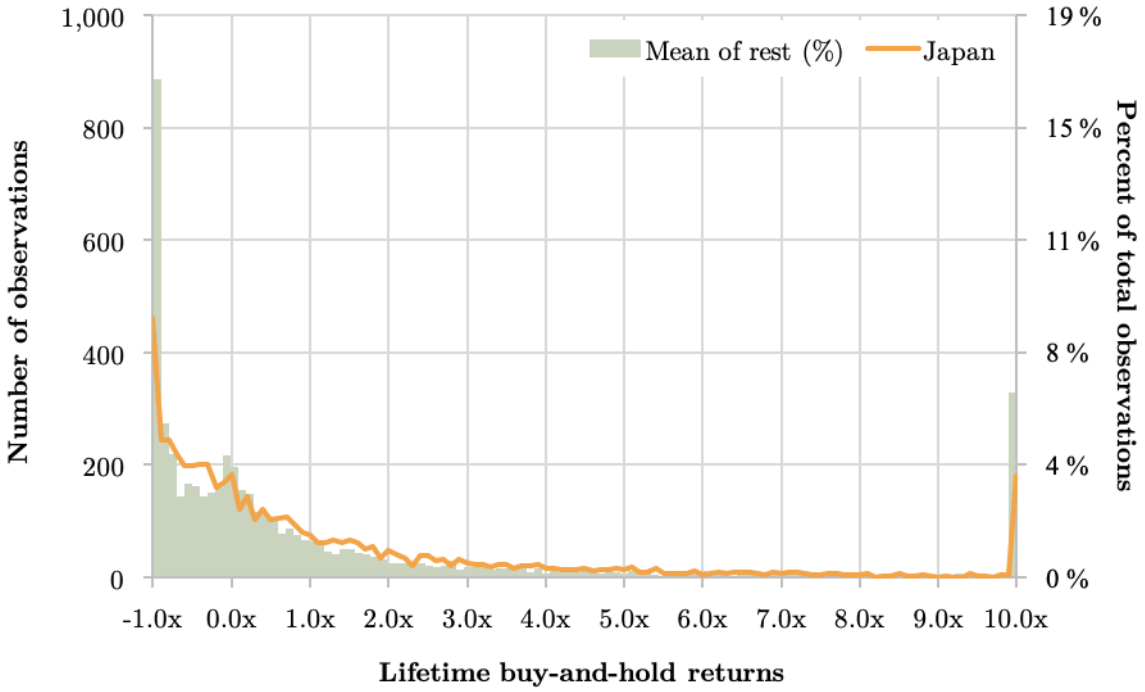
Country	**% > 0**	**% > T-Bill**	**% > VW Mkt. Return**	**% > EW Mkt. Return**
United Kingdom	53.5 %	43.3 %	31.2 %	26.9 %
Japan	56.2 %	51.7 %	38.1 %	14.7 %
Germany	46.3 %	41.8 %	32.6 %	14.7 %
France	58.0 %	51.2 %	37.4 %	20.4 %
Italy	47.4 %	33.5 %	36.0 %	38.2 %
Sweden	53.7 %	49.4 %	36.3 %	33.7 %

1. The table displays lifetime buy-and-hold returns compared against various benchmarks.

As to the initial research question: *Do all stocks fail to outperform Treasury bills?* Based on the results presented in Table 4.1.8, it seems that there is no clear answer to the question. Previous research found that the majority of stocks listed in the US and Norway fail to outperform the Treasury bills over their lifetime (Bessembinder, 2018) (Norang and Agustsson, 2018). We find that the same is true for UK, Germany, Italy and Sweden. However, this is not the case for Japan and France. 51.7% and 51.2% of Japanese and French stocks outperform the corresponding Treasury bills over their lifetime (or sample period).

What separates Japan (Figure 4.1.4) and France from the other markets is the relatively low fraction of failing stocks. Consequently, the distribution is more concentrated and thus the median lifetime return of 21.2% and 25.0%, respectively, is considerably more than what was seen in the other markets.

Figure 4.1.4: Frequency Distribution of Returns, Lifetime Horizon



1. Frequency distribution of Japanese buy-and-hold returns and EW average of remaining markets (in %)

2. Returns are grouped by 10 percent with an overhead bin at >1000%

The frequency graph displays a continued shift towards the left, with an increasing right tail. The two end-peaks are now even more distinct, implying a somewhat "make-or-break"-environment, where there is limited ground between success and failure in the long run. That being said, the leftmost end-peak is significantly larger than the rightmost peak, implying most single-stock investors will lose all their money when investing over a 32-year period.

While most stocks in most markets fail to outperform the Treasury bills, the ones who beat it have proven to make up for the weak performance by the majority. Consequently making the equity market exceedingly attractive on an aggregated level.

4.1.3 Effect of Information

The following section is dedicated to sum up the findings and further interpret the results in the context of financial theory and economic reasoning.

Not surprisingly do all markets have a positive and increasing mean excess return. Thus, conforming to the theory of asset pricing and the principle of risk premium (Damodaran, 2018). Discrepancy between mean and median stock return causes positive skewness in

the return distribution. Positive skewness is present in all markets and horizons, though at varying levels. Importantly, the skewness coefficient is highly sensitive to outliers, thus the metric is subject to strong variations, both within and across markets. Such examples were seen in the UK and Japan[21].

Researchers often assume approximately normally distributed returns. Fama (1964) found that daily stock returns are rather symmetric about their means, but the tails are fatter, implying more outliers. However, as seen in the skewness simulations in Table A.1, even normally distributed one-period returns become positively skewed when compounded over multiple periods. Notably, the empirical findings suggest inconclusive dependency between skewness and compounded stock returns. We therefore argue that there are additional explanatory factors affecting the sample skewness.

Positive skewness in stock returns can in part be attributed to limited liability, which restricts returns to be less than -100%. Because positive returns, in theory, can grow infinitely, the right tail tends to grow as the interval increases.

Survivorship bias could explain why skewness sometimes drop with the interval length. Based on the hypothesis that successful companies live longer than unsuccessful ones, the long lasting companies will have more similar return distributions, thus reducing the sample skewness (Norang and Agustsson, 2018).

Other factors could be technological breakthroughs or firm specific aspects. An example of such is Yahoo Japan, which revolutionized the way of browsing internet when launched in 1996. Today, it is still the most visited web page in Japan (Lee, 2016). Such drastic changes directly affect the stock return, and thus the sample skewness as seen previously (Table 4.1.5).

The presence of skewness is negatively affecting the fraction of stocks that outperform the Treasury bills and market-wide portfolios, both value weighted and equally weighted. The empirical results across all markets are strikingly similar. At the monthly horizon, less than half of all stock returns are positive, and in total approximately 46% generate buy-and-hold returns exceeding the matching Treasury bills. At lifetime horizon the differences are more apparent. The majority of stocks in Germany and Italy fail to generate positive returns over their lifetime. Japan and France are the only covered stock markets where the majority of shares yield returns exceeding the corresponding Treasury bills. With outperformance rates of respectively 51.7% and 51.2%, the numbers are still not impressive given the risk exposure.

[21]The UK sample was subject to multiple outliers, while the Japan sample was strongly influenced by Yahoo Japan Corp.

When evaluated against the VW and EW portfolios, all stocks tend to underperform. Only about one third of all stocks in all markets generate returns superior to the corresponding VW market portfolio at the lifetime horizon. The findings suggest that most investor will find it hard to beat the benchmarks by applying an active, lean portfolio approach.

As to whether this is evidence in favor of or against active portfolio management is dependent on the recipient. Some will argue that their expertise in stock picking will find the fraction of superior stocks. That being said, the majority of active investors will most likely underperform the market benchmarks. Research conducted by Soe and Poirier (2018) supplies empirical evidence that this has been the case historically.

Especially the Japanese stock market revealed deviating results and has collectively performed relatively poorly. However, it was still one of only two markets where the majority of stocks beat the Treasury bills. We argue this can to a large degree be attributed to the extraordinary economic circumstances seen over the last three decades. Up until 1989, Japan was a powerhouse economy with a booming stock market to match it. The bubble burst and the 1990's have been labeled the "lost decade" (Long, 2014). In reality, the same could be said for the decade after. Once the stock prices dropped, banks and insurance companies were left with large volumes of bad debt. Throughout the following years, the Japanese Government and central bank provided substantial fiscal stimulus initiatives to help reboot the troubling economy. As a result, the Japanese debt skyrocketed to become the highest in the world. Today it is roughly 233% of GDP clearly outperforming the runner-up Greece with 177% (Pham, 2017).

Government fiscal stimulus may intervene in the natural process of stocks' lifecycle. Because the sample covers the financial crisis in 2008, all markets have benefited from quantitative easings and other governmental support. However, Japan has been a special case with soaring debt levels and plummeting interest rates. In fact, the Treasury bills were negative for approximately 25% of all observations when matched against stocks. This could very well explain the relatively low fraction of companies failing completely, (Appendix C, Figure C.4).

Out of the five European countries, France is the only in which the majority of the shares' lifetime returns outperform Treasury bills. The outperformance is marginal, but still there are some factors that could explain the findings. Following from the establishment of the European Union, the European Central Bank was created. As a consequence, Germany, France and Italy have all shared the same Treasury rate since 1999. Regardless, the countries have more or less continued their own stock exchanges. Of the three countries, France has been the most successful market over the sample period. Because the European Treasury bills do not solely reflect the French market, it may cause a larger spread between

the economical growth and Treasury rates than the stand-alone market would imply.

On the contrary, Italy may have experienced the opposite. Where France possibly had Treasury rates lower than the economy implied, Italy, with soaring debt and political turbulence, may have had Treasury rates higher than they should have been. This can to some degree explain why Italy by far have the lowest percentage of lifetime stock returns outperforming the corresponding Treasury bills.

Overall, the markets are similar. Despite some deviations, the main characteristics, such as positive sample skewness and poor performance versus benchmarks, more or less tell the same story. The findings contribute weight to a universal understanding of individual stock return distribution. Moreover, it provides support to Bessembinder's rationale on skewness being a decisive explanatory factor for multi-periodical stock return distributions. Dissimilarities do arise, especially in the cases where fundamental economic conditions have been abnormal. Nonetheless, seeing the opposite would rather be unexpected.

4.2 Buy-and-Hold Returns by Size Group

With the knowledge that common stocks struggle to outperform Treasury bills, we look closer to how the aspect of firm size affects the stock returns. In order to compare the stock returns by the size of the firm, the sample is grouped into deciles based on market capitalization on monthly, annual and decade horizons. The lifetime horizon is intentionally excluded, as we argue the market capitalization at the initial listing date is irrelevant for the company's long-term market capitalization.

Findings regarding market capitalization's effect on stock returns, supplement the small-firm effect in the Three Factor Model constructed by Gene Fama and Kenneth French (1993). The model holds that smaller firms, on average, yield higher returns than larger firms. That said, Fama and French's results also suggest that only a few small firms cause the high average return.

For simplicity, the results from the decade horizon are presented in Appendix D (Table D.1 and Table D.2).

4.2.1 Methodology

We have grouped each stock from 1-10 based on the market capitalization at the beginning of the month. For the monthly horizon, the stocks are regrouped for each new month. The groups therefore represent the respective deciles for the stocks listed in that current month. Since we compare stocks within the same period, there is no need for inflation adjustments.

Groupings over the annual and decade horizons are based on the market capitalization of the prior month, as it best reflects the beginning of the interval. Again, we have included stocks that start to trade or delist within the interval to prevent survivorship bias. Stocks that start to trade within the interval, are allocated in the deciles based on the market capitalization of the month they started to trade.

Stocks are not necessarily in the same decile for all horizons. For example, stocks that increase their market capitalization are likely to move up to a higher decile, and vice versa. However, a stock will always remain in the same decile throughout the buy-and-hold return calculation. For instance, at the decade horizon, a stock that is present for the entire sample interval, will be assigned to a decile three times only.

The buy-and-hold returns are calculated using the same methodology as presented in section 4.1.1. The same applies to the benchmark comparisons, where the buy-and-hold returns are matched against Treasury bills and returns from the value and equally weighted market portfolios.

4.2.2 Empirical Results

Monthly Horizon

Table 4.2.1: Buy-and-Hold Returns by Group, Monthly Horizon

Group	Mean	Median	SD	Skew	Mean	Median	SD	Skew
	United Kingdom				***Japan***			
1	0.031	0.000	1.378	136.586	0.020	0.000	0.206	7.964
2	0.005	0.000	0.207	6.207	0.010	0.000	0.154	4.369
3	0.004	0.000	0.187	15.396	0.008	-0.001	0.150	5.449
4	0.005	0.000	0.163	15.478	0.007	-0.001	0.142	5.217
5	0.005	0.000	0.136	2.116	0.006	-0.001	0.135	3.562
6	0.006	0.000	0.127	1.426	0.006	-0.001	0.132	3.419
7	0.007	0.004	0.119	2.050	0.005	0.000	0.123	1.669
8	0.009	0.006	0.114	0.887	0.006	0.000	0.117	1.578
9	0.009	0.009	0.107	0.466	0.005	0.000	0.106	0.914
10	0.009	0.009	0.092	0.101	0.005	0.002	0.099	0.563
	Germany				***France***			
1	0.118	0.000	3.338	75.796	0.047	0.000	0.808	84.744
2	0.006	-0.001	0.451	52.791	0.012	0.000	0.673	132.430
3	0.001	-0.002	0.228	23.080	0.006	0.000	0.164	4.743
4	0.002	0.000	0.160	1.647	0.007	0.000	0.169	15.329
5	0.002	0.000	0.149	2.431	0.008	0.000	0.143	7.263
6	0.002	0.000	0.134	1.512	0.007	0.000	0.126	2.622
7	0.004	0.000	0.125	1.740	0.010	0.000	0.119	2.433
8	0.007	0.000	0.115	1.416	0.009	0.002	0.116	1.238
9	0.008	0.003	0.107	1.473	0.008	0.004	0.101	0.459
10	0.008	0.007	0.096	2.505	0.009	0.009	0.090	0.301
	Italy				***Sweden***			
1	0.008	-0.008	0.248	27.986	0.022	0.000	0.380	13.764
2	0.002	-0.007	0.155	4.961	0.004	-0.008	0.213	3.935
3	0.001	-0.005	0.123	1.923	0.005	-0.004	0.183	3.315
4	0.002	-0.006	0.123	2.627	0.009	0.000	0.170	4.970
5	0.002	-0.003	0.123	5.474	0.010	0.000	0.149	2.572
6	0.003	-0.002	0.114	1.566	0.010	0.000	0.140	1.513
7	0.007	0.000	0.151	29.154	0.011	0.002	0.125	0.959
8	0.007	0.003	0.108	2.085	0.013	0.009	0.113	1.065
9	0.006	0.003	0.105	0.923	0.011	0.008	0.098	0.406
10	0.005	0.003	0.095	0.604	0.012	0.009	0.090	0.663

1.The stocks are divided into deciles based on market capitalization. The table gives an overview of the buy and hold return with monthly intervals for individual stocks on the British, Japanese, German, French, Italian and Swedish stock market.

For all the markets in Table 4.2.1, the mean return decreases from decile ten to decile one. Despite some deviations in the mid-groups, the results display a declining trend.

Furthermore, the overall median return is increasing with the size of the firms. In theory, smaller, volatile firms should have higher mean and lower median compared to larger firms. These patterns are prominent for all markets.

Because the samples are divided into deciles, the differences between the groups are limited and possibly overlapping. Further, since the deciles from smaller samples (like Italy and Sweden) contain relatively few stocks, they also become increasingly sensitive to single observations. Therefore, it is important to consider the whole picture when interpreting the results.

Because decile one has a higher mean and decile ten has a higher median in all markets, the findings align with theory of the small firm effect. Notably, there are some deviating results, especially with regards to the mean return. A possible cause is the short time interval. With monthly observations, extraordinary returns may have significant impact on the group average.

Table 4.2.1 also conforms to the theory that returns of small firms are more volatile and skewed. For instance, decile one in the Japanese market has a skewness of 7.694 and a standard deviation of 0.206. Compared to decile ten (skewness of 0.563 and standard deviation of 0.099), the numbers are considerably higher. The findings are intuitive – large firms are considered to be more stable and safe, whereas smaller firms diverge more with many negative returns and a few extremely high. Thus, positive skewness arises.

Again, it is important to keep in mind that some of the skewness coefficients are strongly affected by a few outliers with extraordinarily high return observations. The skewness coefficient should therefore be interpreted with some caution, as it may not portray the exact distribution.

Table 4.2.2: BaHR by Group vs Benchmarks, Monthly Horizon

Group	% > 0	% > T-Bill	% > VW	% > EW	% > 0	% > T-Bill	% > VW	% > EW
	United Kingdom				***Japan***			
1	31.6%	31.3%	41.2%	41.1%	46.8%	47.8%	47.2%	45.1%
2	37.1%	36.7%	42.0%	41.9%	47.0%	47.5%	46.5%	44.1%
3	40.3%	39.7%	42.5%	42.3%	46.7%	47.2%	45.9%	43.7%
4	43.6%	42.6%	43.9%	43.8%	46.9%	47.4%	46.0%	43.5%
5	46.5%	45.3%	45.0%	44.8%	47.1%	47.5%	46.0%	43.6%
6	49.2%	47.7%	46.4%	46.0%	47.5%	47.8%	46.3%	43.7%
7	51.4%	50.0%	47.8%	47.5%	48.2%	48.3%	46.4%	44.2%
8	53.1%	51.5%	48.6%	48.2%	49.4%	49.5%	47.5%	45.4%
9	54.4%	52.8%	49.8%	49.2%	49.7%	49.8%	47.8%	45.7%
10	55.0%	53.1%	49.9%	49.5%	50.4%	50.4%	48.5%	46.4%
	Germany				***France***			
1	38.4 %	41.3 %	44.0 %	41.5 %	39.0 %	38.6 %	41.9 %	41.8 %
2	39.3 %	40.8 %	42.3 %	38.8 %	41.6 %	40.6 %	42.4 %	42.3 %
3	41.4 %	42.2 %	43.2 %	40.0 %	44.0 %	42.7 %	43.8 %	43.5 %
4	44.1 %	44.5 %	44.3 %	41.2 %	44.7 %	43.2 %	43.7 %	43.8 %
5	44.9 %	44.9 %	44.3 %	40.7 %	46.0 %	45.0 %	44.7 %	45.4 %
6	46.5 %	46.1 %	45.1 %	41.6 %	47.1 %	45.3 %	45.8 %	45.7 %
7	47.9 %	47.2 %	46.4 %	42.7 %	49.5 %	47.7 %	47.4 %	48.1 %
8	49.7 %	48.7 %	48.0 %	43.7 %	51.7 %	50.1 %	49.0 %	50.0 %
9	52.1 %	51.0 %	48.8 %	44.9 %	51.5 %	49.8 %	49.1 %	49.2 %
10	54.5 %	53.4 %	49.9 %	46.4 %	51.6 %	49.9 %	49.2 %	49.6 %
	Italy				***Sweden***			
1	39.0 %	38.6 %	41.9 %	41.8 %	40.2 %	40.7 %	42.3 %	42.6 %
2	41.6 %	40.6 %	42.4 %	42.3 %	41.6 %	41.9 %	41.7 %	41.8 %
3	44.0 %	42.7 %	43.8 %	43.5 %	44.2 %	44.4 %	42.8 %	43.0 %
4	44.7 %	43.2 %	43.7 %	43.8 %	46.4 %	46.7 %	44.6 %	44.3 %
5	46.0 %	45.0 %	44.7 %	45.4 %	47.8 %	48.0 %	45.6 %	45.3 %
6	47.1 %	45.3 %	45.8 %	45.7 %	48.6 %	48.8 %	45.4 %	46.0 %
7	49.5 %	47.7 %	47.4 %	48.1 %	50.3 %	50.2 %	47.6 %	47.7 %
8	51.7 %	50.1 %	49.0 %	50.0 %	53.8 %	53.5 %	49.2 %	49.4 %
9	51.5 %	49.8 %	49.1 %	49.2 %	53.8 %	53.5 %	49.7 %	49.2 %
10	51.6 %	49.9 %	49.2 %	49.6 %	54.9 %	54.2 %	50.2 %	49.9 %

1.The stocks are divided into deciles based on market capitalization. The table gives an overview of the monthly buy and hold return compared to different Benchmarks to see how the returns performed relatively. The table includes individual stocks on the British, Japanese, German, French, Italian and Swedish stock market.

Table 4.2.2 shows that larger firms are more likely to beat Treasury bills. For decile one in all markets, only a minority of buy-and-hold returns outperform Treasury bills. Decile ten in all markets performs significantly better against the benchmarks.

Larger firms are also more likely to yield positive returns compared to smaller firms. The pattern is consistent versus the value weighted market as well. Still, only a minority of the returns from decile ten in all markets except Sweden are able to beat the VW market return.

Annual Horizon

Table 4.2.3: Buy-and-Hold Returns by Group, Annual Horizon

Group	Mean	Median	SD	Skew	Mean	Median	SD	Skew
	United Kingdom				***Japan***			
1	-0.126	-0.212	1.217	32.654	-0.031	-0.060	0.496	2.214
2	0.027	-0.087	2.254	60.534	0.045	-0.013	0.490	2.246
3	0.059	-0.022	0.879	13.068	0.071	0.002	0.519	2.920
4	0.137	0.022	0.879	9.684	0.096	0.007	0.580	4.482
5	0.160	0.065	0.808	12.612	0.125	0.018	0.642	5.367
6	0.194	0.081	0.889	14.051	0.140	0.025	0.677	7.234
7	0.220	0.114	0.915	14.779	0.155	0.034	0.691	7.640
8	0.215	0.126	0.809	18.887	0.166	0.042	0.758	13.974
9	0.211	0.138	1.013	45.825	0.177	0.047	0.904	22.807
10	0.187	0.141	0.460	6.129	0.162	0.057	0.814	23.249
	Germany				***France***			
1	-0.092	-0.250	1.144	9.350	-0.063	-0.136	0.711	4.964
2	-0.011	-0.121	1.161	10.671	0.058	-0.035	1.674	34.816
3	0.018	-0.070	0.967	9.238	0.063	-0.005	0.642	6.790
4	0.130	-0.024	3.069	39.775	0.114	0.027	0.672	8.048
5	0.113	0.015	0.888	15.531	0.152	0.048	0.671	5.681
6	0.172	0.048	2.088	39.669	0.233	0.086	3.668	43.415
7	0.170	0.062	0.646	6.702	0.187	0.104	0.632	9.108
8	0.175	0.082	0.568	3.905	0.202	0.129	0.603	6.464
9	0.203	0.097	0.598	6.652	0.185	0.130	0.457	2.642
10	0.169	0.106	0.444	4.097	0.159	0.131	0.373	1.423
	Italy				***Sweden***			
1	-0.111	-0.154	0.530	4.998	-0.148	-0.243	0.657	2.906
2	-0.041	-0.069	0.406	1.577	-0.032	-0.103	0.672	4.151
3	0.029	-0.034	0.535	5.342	0.076	-0.043	0.716	3.357
4	0.028	-0.017	0.454	3.376	0.222	0.023	1.782	22.870
5	0.078	0.007	0.498	2.055	0.187	0.059	0.788	6.012
6	0.091	0.018	0.465	2.863	0.251	0.106	0.940	11.967
7	0.105	0.035	0.493	4.786	0.253	0.139	0.698	3.349
8	0.135	0.079	0.440	1.403	0.258	0.166	0.646	4.173
9	0.147	0.054	0.620	6.481	0.216	0.163	0.433	1.395
10	0.147	0.080	0.481	4.184	0.235	0.197	0.690	13.936

1. The table displys stock returns grouped and linked over the annual horizon.

Table 4.2.3 displays summary statistics over the annual horizon. Observing the mean and median returns, there are some unexpected results. Both mean and median are now higher for the larger companies.

While mean returns are not the main focus of this paper, we find it appropriate to offer some possible explanations to why the tables have turned. It could be that, over the longer horizon, none of the smaller firms manage to consistently deliver exceptionally high returns. When most of the small stocks produce negative returns, the mean declines. Or, with regards to decile ten, it is not unrealistic that some stocks produce exceptionally high returns. When the majority of the rest generate stable, positive returns (Table 4.2.4), it excels the mean. Another consideration is how the end-groups may capture the momentum of some stocks. A booming stock, cannot grow beyond decile ten, and vice versa, a plummeting stock cannot fall below decile one. Thus, the end-groups capture the best and the worst, which may impact the metrics.

Table 4.2.3 further reveals inconsistency in the skewness and standard deviation. By intuition, we should expect smaller firms to be riskier and supposedly have higher volatility. This is not the case for all markets. Especially the Japanese market reveals surprising results, where decile ten has substantially higher standard deviation than decile one. There are numerous possible explanations. Distant outliers could be one explanation. Another could be the challenging economical conditions in Japan, that strongly affected some of the large firms.

Overall, the findings imply the small firm effect cannot be observed for annual buy-and-hold returns, and are therefore not consistent with theory.

Table 4.2.4: BaHR by Group vs Benchmarks, Annual Horizon

Group	% > 0	% > T-Bill	% > VW	% > EW	% > 0	% > T-Bill	% > VW	% > EW
	United Kingdom				***Japan***			
1	29.6%	26.4%	23.0%	22.6%	42.5%	42.1%	35.8%	27.1%
2	40.1%	36.3%	31.9%	31.3%	48.0%	47.2%	41.8%	32.8%
3	46.0%	41.3%	35.7%	35.0%	50.2%	49.3%	44.7%	35.9%
4	53.0%	47.9%	41.7%	40.6%	50.9%	50.2%	46.2%	37.5%
5	58.4%	53.5%	46.0%	44.3%	52.8%	51.8%	48.2%	40.4%
6	61.1%	55.5%	49.4%	48.0%	53.9%	52.6%	49.9%	41.4%
7	63.8%	58.6%	51.7%	49.8%	55.2%	54.1%	50.8%	43.5%
8	66.2%	60.8%	54.4%	52.0%	56.3%	55.2%	51.2%	44.2%
9	67.6%	62.5%	55.9%	52.8%	57.3%	56.1%	53.2%	45.9%
10	69.9%	63.7%	57.1%	54.5%	58.5%	57.3%	54.3%	45.9%
	Germany				***France***			
1	29.6 %	28.8 %	25.5 %	20.0 %	33.0 %	31.8 %	27.5 %	23.0 %
2	36.4 %	34.8 %	29.4 %	24.3 %	42.8 %	39.8 %	35.3 %	30.4 %
3	41.2 %	39.8 %	32.0 %	25.2 %	47.7 %	44.7 %	38.8 %	33.6 %
4	45.9 %	43.6 %	36.0 %	27.7 %	53.5 %	50.3 %	42.8 %	38.4 %
5	52.6 %	49.0 %	42.4 %	32.7 %	57.5 %	54.6 %	45.8 %	39.2 %
6	57.2 %	54.1 %	46.0 %	36.1 %	61.7 %	57.7 %	49.5 %	41.3 %
7	59.7 %	56.4 %	48.9 %	37.7 %	64.0 %	59.9 %	51.8 %	42.6 %
8	64.0 %	60.1 %	51.9 %	39.6 %	67.0 %	63.7 %	54.7 %	46.0 %
9	66.7 %	62.5 %	54.3 %	41.1 %	66.9 %	63.9 %	55.6 %	45.3 %
10	68.3 %	64.7 %	56.3 %	40.2 %	68.2 %	64.7 %	56.2 %	42.8 %
	Italy				***Sweden***			
1	30.1 %	27.7 %	24.2 %	25.0 %	31.2 %	29.3 %	22.6 %	21.3 %
2	38.0 %	34.3 %	29.9 %	31.3 %	37.9 %	36.0 %	29.5 %	29.1 %
3	44.9 %	40.0 %	36.8 %	36.9 %	44.6 %	42.7 %	37.8 %	36.6 %
4	46.5 %	42.2 %	38.5 %	41.5 %	53.4 %	51.1 %	42.7 %	41.4 %
5	51.2 %	46.1 %	41.7 %	43.7 %	57.0 %	54.6 %	46.3 %	43.0 %
6	52.5 %	47.1 %	45.7 %	48.1 %	60.8 %	58.4 %	48.5 %	49.2 %
7	56.2 %	49.2 %	49.7 %	51.7 %	64.3 %	62.5 %	52.6 %	50.7 %
8	60.0 %	55.1 %	52.3 %	54.3 %	67.5 %	65.2 %	54.5 %	53.3 %
9	57.5 %	51.7 %	49.3 %	51.1 %	71.5 %	67.9 %	54.7 %	52.4 %
10	62.8 %	57.8 %	56.8 %	56.7 %	71.3 %	69.0 %	57.5 %	54.4 %

1. The table displays stock returns by size group over the annual horizon, compared to various benchmarks.

Table 4.2.4 reveals that decile one's performance versus Treasury bills has decreased compared to the monthly horizon. For decile ten, the opposite trend is evident. The results clearly indicate that, over the annual horizon, the majority of large firms outperform Treasury bills, whereas the majority of small firms are far from doing it.

Compared to the VW market returns, Table 4.2.4 shows that the majority of stocks in the highest deciles outperform the VW market return. These findings emphasize the value of holding larger firms in the portfolio when investing over an annual horizon. Compared to the EW market portfolio, the results are more varying. Still, decile ten performs best relatively, however, only in UK, Italy and Sweden do the majority of stocks yield superior returns.

4.2.3 Effect of Information

All markets illustrate relatively similar patterns. The results from the monthly horizon are consistent with theory and the small firm effect. The mean return is highest for the lowest decile, and the median return is highest for the largest decile. Certain deciles in UK, Germany, and France display abnormally high skewness coefficients, however, this is primarily caused by a few outliers.

The annual and decade horizons are, for all six markets, not consistent with theory and the small firm effect. The largest firms have both higher mean *and* median return. Such findings imply the smaller firms fail to consistently generate high returns over longer periods, in fact, most of them produce negative returns. The same findings were present in the Norwegian market and, though only at the decade horizon, in the US[22]. Notably, Bessembinder's data sample spans over a substantially longer time period, which gave him considerably more annual returns in each decile, and thus a better analytical foundation.

Furthermore, the majority of stocks from higher decile groups outperform Treasury bills, while the lowest deciles fail to do so. For the lowest decile stocks in all markets, just a fraction provide returns over the decade horizon that exceed Treasury bills[23]. Buy-and-hold returns from large-capitalization stocks are also more likely to beat the VW market returns. Thus illustrating the value of holding larger firms to increase the likelihood of outperforming the market benchmarks.

By intuition, one should expect smaller firms to be riskier and supposedly have higher volatility. However, Table D.1 (Appendix F) reveals this is not the case for our results at decade horizon. Here, some of the markets' highest deciles also accumulate the largest skewness and standard deviation. A reason may be that, as an end-bin, the differences

[22]Both Bessembinder, and Norang and Augustson got deviating results which are not consistent with theory. Norang and Augustson used quantiles instead of deciles to give a clearer distinction between the groups, but it did not make any impact on the results.

[23]Appendix F: Table D.2

may be large, especially with regards to the smaller samples. In some cases larger firms are shifting more, either producing extraordinarily high returns or fail to keep up with time and fall behind. For instance, Deutsche Bank was hit hard by the financial crisis in 2007-2008. Until its peak in 2007, the company experienced formidable growth, yielding a cumulative return of 192% between 1996 and 2005. However, between 2006 and 2015, most of the value vanished as the stock plummeted -59%. The example illustrates how large companies also are subject to strong variations.

To sum it all up. A commonality for all markets is that the small firm effect seems not to be present at the annual and decade horizon. At the monthly horizon the effect is present, but not surprisingly, the results are subject to some deviations.

Regarding the main question of interest – *do stocks outperform Treasury bills?* We find that the results for small and big firms differ. For the largest firms (decile ten) we see that the majority of stocks actually do outperform Treasury bills.

4.3 Bootstrap Simulation

Most of the stocks included in the six data samples have a lifespan much shorter than the full 32-year sample period. In fact, the average lifetime of a stock in UK is 10 $\frac{1}{2}$ years. For Japan, Germany, France, Italy and Sweden, the numbers are 18, 12 $\frac{1}{2}$, 10 $\frac{1}{2}$, 11 $\frac{1}{2}$ and 8 years, respectively. To obtain complete results that reflect the long-term performance over the total sample period, we conduct a bootstrap procedure. The simulations are intended to replicate the payoff of following a strategy where an investor holds a single, random stock each month over various periods: annual, decade and the full 32-year period.

For simplicity, the results from the decade horizon are presented in Appendix E (Table E.1 and Table E.2).

4.3.1 Methodology

The bootstrap simulation draw random stock returns every month. It draws for five different portfolio sizes of 1, 5, 25, 50 and 100 stocks. For instance, for a portfolio size of five stocks, we draw five random stock returns each month. The portfolios' returns are value weighted based on the stocks that were picked the same month. We simulate every portfolio size over annual, decade and 32-year horizons. Hence, for annual horizon, we draw equally many random returns as the portfolio size every month, and simulate annual buy-and-hold returns based on the twelve months of the returns that was drawn. The simulation includes returns from each month between 1986 and 2017.

In order to best illustrate all possible outcomes for the different portfolios, we have simulated 20,000 32-year returns, 60,000 decade returns, and 640,000 annual returns. To prevent the possibility of drawing the same stock twice in the same draw (i.e. the same month), we have conducted the bootstrap simulation without replacement.

Again, we compare the returns from the five portfolios with the three market benchmarks (Treasury bill, VW and EW portfolio). This is done using the same methodology as described in the Buy-and-Hold Returns chapter (4.1.1).

4.3.2 Empirical Results

Annual Horizon

Table 4.3.1: Bootstrap Simulation, Annual Horizon

	Mean	**Median**	**SD**	**Skew**	**Mean**	**Median**	**SD**	**Skew**
	United Kingdom				***Japan***			
1 Stock Portfolio	0.142	0.012	2.905	421.832	0.118	0.013	0.601	4.927
5 Stock Portfolio	0.119	0.099	0.334	1.373	0.081	0.041	0.371	1.077
25 Stock Portfolio	0.117	0.124	0.238	0.173	0.071	0.048	0.311	0.610
50 Stock Portfolio	0.115	0.129	0.212	-0.083	0.069	0.049	0.299	0.838
100 Stock Portfolio	0.112	0.132	0.190	-0.364	0.066	0.049	0.290	0.417
	Germany				***France***			
1 Stock Portfolio	0.185	-0.021	3.928	167.646	0.176	0.038	1.735	183.283
5 Stock Portfolio	0.093	0.068	0.334	1.349	0.134	0.116	0.353	5.751
25 Stock Portfolio	0.097	0.099	0.267	0.063	0.128	0.139	0.276	0.002
50 Stock Portfolio	0.094	0.103	0.255	-0.241	0.123	0.140	0.258	-0.166
100 Stock Portfolio	0.089	0.103	0.245	-0.406	0.120	0.141	0.245	-0.279
	Italy				***Sweden***			
1 Stock Portfolio	0.083	0.000	0.554	9.537	0.184	0.064	0.796	15.905
5 Stock Portfolio	0.092	0.068	0.341	1.294	0.178	0.161	0.373	0.757
25 Stock Portfolio	0.092	0.089	0.278	0.314	0.170	0.181	0.291	0.027
50 Stock Portfolio	0.091	0.099	0.263	0.227	0.167	0.177	0.278	-0.099
100 Stock Portfolio	0.090	0.112	0.252	0.164	0.165	0.172	0.271	-0.170

1. The table presents an overview of the returns from the bootstrap simulation for the 1, 5, 25, 50 and 100 stock portfolios from all of the six stock markets. These returns are linked to annual horizon. The bootstrap simulation is repeated 20,000 times, meaning that we have 640,000 annual returns.

By including more stocks to the portfolio, i.e. increase diversification, it is clear from Table 4.3.1 that the average return is decreasing. This applies for all markets, except for Italy[24]. As expected, the inverse pattern is evident for the median return, increasing with the portfolio size. This is consistent with theory, where an investor is exposed to more risk by having fewer stocks in the portfolio (Markowitz, 1952). On average, the investor gets a higher return, but the high return is provided by only a few exceptional portfolios that contains one of the few exceptional stocks. This is also verified by the standard deviation declining with the portfolio size.

Examining the skewness coefficients in Table 4.3.1, we see a drastic change from having just one stock in the portfolio, to having five stocks. By doing such in the French market, the skewness decreases substantially from 183 to 5.75. In fact, the skewness coefficient turns negative for larger portfolios in UK, France and Sweden. This, in addition to the reduction in volatility, is a clear indication of how much an investor can reduce the risk by diversifying, even just from one stock to five stocks. Maybe even more interesting, is how trivial the decrease in mean return is, compared to the decrease in volatility when growing the portfolio from five stocks to 100 stocks.

[24]The Italian sample data contains a few large firms that have generated supremely high returns (Brighi and D'Addona, 2008). The more concentrated a portfolio is, the less likely it is to pick one of these few winners. Thus, a one stock portfolio in the Italian market has a lower average return.

Table 4.3.2: Bootstrap vs Benchmarks, Annual Horizon

	% > 0	% > T-Bill	% > VW Mkt	%>0	% > T-Bill	% > VW Mkt
	United Kingdom			***Japan***		
1 Stock Portfolio	51.1 %	44.7 %	40.0 %	51.3 %	49.9 %	46.4 %
5 Stock Portfolio	64.1 %	54.4 %	45.3 %	55.2 %	53.5 %	48.8 %
25 Stock Portfolio	71.1 %	60.3 %	47.0 %	57.5 %	55.5 %	49.9 %
50 Stock Portfolio	73.2 %	62.1 %	47.0 %	58.0 %	56.0 %	50.1 %
100 Stock Portfolio	74.8 %	63.6 %	46.8 %	58.3 %	56.2 %	50.2 %
	Germany			***France***		
1 Stock Portfolio	48.1 %	44.7 %	41.9 %	53.5 %	49.8 %	43.0 %
5 Stock Portfolio	59.3 %	54.7 %	48.0 %	64.1 %	59.9 %	48.1 %
25 Stock Portfolio	65.9 %	60.5 %	51.7 %	69.5 %	64.7 %	50.4 %
50 Stock Portfolio	67.9 %	62.1 %	52.0 %	71.2 %	66.0 %	50.5 %
100 Stock Portfolio	69.3 %	64.1 %	51.5 %	73.0 %	67.1 %	50.3 %
	Italy			***Sweden***		
1 Stock Portfolio	50.0 %	44.9 %	41.1 %	55.2 %	52.5 %	44.2 %
5 Stock Portfolio	58.0 %	52.2 %	46.1 %	67.7 %	65.2 %	49.0 %
25 Stock Portfolio	61.1 %	54.8 %	48.0 %	73.5 %	71.4 %	50.0 %
50 Stock Portfolio	61.7 %	55.6 %	48.5 %	75.0 %	72.9 %	49.9 %
100 Stock Portfolio	62.0 %	56.7 %	42.8 %	76.2 %	74.4 %	49.7 %

1. The table presents an overview of the returns from the bootstrap simulation compared to different Benchmarks to see how the returns performed relatively. This is done for the 1, 5, 25, 50 and 100 stock portfolios from all of the six stock markets. These returns are linked to annual horizon. The bootstrap simulation is repeated 20,000 times, meaning that we have 640,000 annual returns.

Picking a random stock each month over the annual horizon would, for five out of six markets, mostly yield positive returns. Germany is the only market where the majority of the 640,000 drawn annual returns are negative. Compared to Treasury bills, Sweden is the only market where the majority of the computed one-stock portfolio returns outperform Treasury bills.

Table 4.3.2 further illustrates the effect of diversification. By growing the portfolio to include five stocks, the majority of the returns in all markets beat Treasury bills. The fractions increase as the the portfolios become increasingly fragmented. Note from Table 4.3.2, in only three out of six markets, the majority of 100-stock portfolios provide returns superior to the VW market.

32-Year Horizon

Table 4.3.3: Bootstrap Simulation, 32-Year Horizon

	Mean	Median	SD	Skew	Mean	Median	SD	Skew
	United Kingdom				*Japan*			
1 Stock Portfolio	28.134	-0.474	1496.72	137.538	10.285	-0.022	82.266	33.355
5 Stock Portfolio	19.526	7.692	45.673	13.138	4.051	1.209	10.151	9.391
25 Stock Portfolio	21.431	14.809	22.296	3.428	2.847	1.710	3.892	3.954
50 Stock Portfolio	20.613	16.069	16.750	2.632	2.459	1.781	2.620	3.018
100 Stock Portfolio	19.707	16.793	12.293	2.160	2.219	1.787	1.846	1.886
	Germany				*France*			
1 Stock Portfolio	31.743	-0.840	767.929	54.751	59.270	0.776	747.407	49.317
5 Stock Portfolio	7.817	2.789	17.888	9.736	25.313	10.853	50.776	8.106
25 Stock Portfolio	9.003	5.985	10.778	4.578	20.466	15.127	18.587	3.053
50 Stock Portfolio	7.640	5.813	7.066	2.536	18.057	15.135	12.069	2.070
100 Stock Portfolio	6.369	5.315	4.921	1.853	16.399	15.035	7.646	1.417
	Italy				*Sweden*			
1 Stock Portfolio	4.451	-0.321	50.320	65.946	69.345	0.962	2599.35	134.194
5 Stock Portfolio	5.576	2.611	10.296	8.030	68.482	33.151	118.151	7.116
25 Stock Portfolio	5.627	4.566	4.286	2.175	63.504	50.709	48.235	2.636
50 Stock Portfolio	5.654	5.040	3.064	1.497	57.592	50.148	32.750	1.876
100 Stock Portfolio	5.586	5.312	1.898	0.908	53.136	49.352	21.001	1.233

1.The table presents the same overview as Table 4.3.1, but now the returns are linked over 32 years.

Table 4.3.3 provides an overview of return simulations linked over the 32-year sample period. The results display clear trends, however, there are a few deviations from what one would expect. Similar to the annual horizon, the pattern is apparent and in line with theory for the Japanese, French and Swedish stock markets. By including more stocks in the portfolio, the average return declines. Again, the effect is reversed for the median return. For the British and German markets, the mean return declines from one-stock to five-stock portfolios, but increases for 25-stock portfolios. These findings are somewhat counterintuitive, as there no longer is a tradeoff between risk and reward – the return increases while the risk exposure decreases. The deviating results might be explained by the fact that portfolios constituting five and 25 stocks, still not are fully diversified. Thus, the results may overlap. Especially since the portfolios are value weighted, high returns

from large stocks can have considerable impact on the portfolio returns[25].

Table 4.3.3 illustrates how the skewness and volatility both are negatively correlated with the portfolio size. The effect of just including four stocks to a one-stock portfolio drastically reduces the skewness and volatility. For instance, going from a one-stock portfolio to a five-stock portfolio in the French market, reduces the standard deviation by 93% and skewness by 84%. The numbers clearly emphasize the effect of diversification on risk exposure.

The average returns reflect the success of each stock market over the sample period. Buy-and-hold returns from the Japanese and Italian stock markets both lag behind the rest. For example, the average return for a 100-stock portfolio in Japan is 221.9%, whereas the corresponding portfolio in UK yields 1970.7%. This illustrates how much more rewarding the aggregate stock market has been in Britain compared to Japan. Notably, the effects of compounding contribute to accelerate the differences as well.

[25] As mention the Italian sample data consist of some few large firms that have computed high returns, and gives deviating results for the average return (Brighi and D'Addona, 2008).

Table 4.3.4: Bootstrap vs Benchmarks, 32-Year Horizon

	% > 0	% > T-Bill	% > VW Mkt	%>0	% > T-Bill	% > VW Mkt
	United Kingdom			***Japan***		
1 Stock Portfolio	40.5 %	20.0 %	9.4 %	49.7 %	41.5 %	32.0 %
5 Stock Portfolio	94.3 %	66.4 %	28.6 %	73.0 %	60.3 %	43.0 %
25 Stock Portfolio	100.0 %	91.1 %	44.0 %	88.2 %	73.5 %	49.1 %
50 Stock Portfolio	100.0 %	96.1 %	47.3 %	93.5 %	79.0 %	50.3 %
100 Stock Portfolio	100.0 %	99.1 %	49.6 %	97.5 %	85.1 %	50.6 %
	Germany			***France***		
1 Stock Portfolio	28.0 %	18.2 %	13.6 %	58.6 %	39.6 %	20.2 %
5 Stock Portfolio	84.4 %	58.3 %	40.3 %	97.5 %	82.6 %	40.8 %
25 Stock Portfolio	96.7 %	83.2 %	62.4 %	100.0 %	97.9 %	51.0 %
50 Stock Portfolio	97.6 %	85.3 %	63.7 %	100.0 %	99.5 %	51.3 %
100 Stock Portfolio	99.1 %	85.7 %	61.0 %	100.0 %	100.0 %	51.2 %
	Italy			***Sweden***		
1 Stock Portfolio	42.5 %	15.7 %	12.7 %	59.8 %	38.7 %	11.2 %
5 Stock Portfolio	88.3 %	38.0 %	28.9 %	99.9 %	96.1 %	38.0 %
25 Stock Portfolio	99.8 %	57.1 %	39.0 %	100.0 %	100.0 %	53.4 %
50 Stock Portfolio	100.0 %	66.8 %	42.1 %	100.0 %	100.0 %	53.7 %
100 Stock Portfolio	100.0 %	79.8 %	44.6 %	100.0 %	100.0 %	53.5 %

1.The table presents the same overview as Table 4.3.2, but now the returns are linked to the 32-year horizon.

Comparing the returns from the various portfolios with Treasury bills, we observe the same pattern in Table 4.3.4 as was seen at the annual horizon (4.3.2). Most of the single-stock portfolios' returns do not beat Treasury bills, but as the portfolio size grows, the fraction outperforming Treasury bills increase. A fascinating observation is how every single simulated 100-stock portfolio from the French and Swedish stock markets outperform Treasury bills.

For single-stock portfolios, most of the returns in UK, Japan, Germany and Italy are negative. By including four more stocks to the portfolio, the number of positive returns increase substantially. Thus illustrating how the risk of obtaining negative portfolio returns decrease with diversification. In addition, the findings in Table 4.3.4 provide contributing evidence to the empirics that less diversified portfolio often underperform benchmarks

(Ikenberry et al., 1998). Holding a single-stock portfolio, only a fraction of the returns outperforms the VW market return. As more stocks are included in the portfolio, the chance of beating the VW market increases.

4.3.3 Effect of Information

The bootstrap simulations provide supplementing evidence to the understanding of return characteristics of stocks. Not surprisingly do the results vary quite, depending on the portfolio size. For all markets, most returns from one-stock portfolios over the 32-year horizon are far from outperforming Treasury bills. This is clearly in contrast compared to the 100-stock portfolio, where most returns do.

The findings from Japan, France and Sweden were in line with our hypothesis based on the theory on diversification (Markowitz, 1952). UK and Germany revealed some deviating results with regards to risk-return trade-off. However, overall the patterns were more or less aligned with the rest.

The results from the Italian market are difficult to interpret. There were only minor differences in the mean returns between the various portfolio sizes. A possible explanation could be due to a few, major stocks generating high returns (Brighi and D'Addona, 2008). Because the Italian sample is relatively small and the portfolios are value weighted, the few stocks will account for the majority of the portfolios' returns when picked.

For all markets and horizons there is an extensive decrease in skewness as the portfolio sizes increase, implying diversification reduces skewness. These findings are similar to that of Simkowitz's and Beedles's (1978). Moreover, four out of six markets exhibit negative skewness for 100-stock portfolios at the annual horizon. This is a fascinating finding, though not entirely new to research on portfolio returns. Rui Albuquerque (2012) argued that negative skewness for diversified portfolios at a relatively short horizon can arise due to heterogeneity in information announcement dates across stocks. For longer horizons the skewness remains positive, although plummeting as the portfolios are increasingly diversified.

The more stocks an investor includes in his portfolio, the more likely he is to outperform Treasury bills and the VW market return. This applies for all markets, and is in line with the findings from the US and Norwegian markets[26]. The results illustrate the risk of holding an undiversified portfolio, and may contribute to the findings of Heaton et al. (2017) who exhibited why active equity managers tend to underperform the benchmark

[26]Bessembinder and Norang & Agustsson came to the same results; the more an investor diversify, the more likely he is to beat Treasury bills

index. Especially for investors holding a limited number of stocks (Ikenberry et al., 1998).

4.4 Wealth Creation

In this section, we analyse the net value creation from a shareholder's perspective. The value creation is measured for individual stocks, as well as the aggregated stock markets. We find it relevant to include such an analysis in order to supplement the buy-and-hold research and to provide an additional dimension to the topic of interest.

In the buy-and-hold analysis, we assumed that the hypothetical investor reinvested all dividends, and made no other transactions after the initial purchase. However, Dichev (2007) argues the assumption that the hypothetical investor reinvest dividends does not reflect a realistic investor. Equity investors, on average, do not reinvest dividends (Bessembinder, 2018). If an investor wants to reinvest dividends, another investor needs to sell. Assuming that these transactions go through without affecting the stock price, may not be a realistic approach.

Another aspect is the fact that a high buy-and-hold return does not need to imply a large wealth creation. Buy-and-hold returns are therefore not necessarily a good measure of a company's success. For instance, the Swedish company Fastighets Balder AB, yielded an annualized return of -11%, and a lifetime buy-and-hold return of -87.7%. However, the company has generated wealth equal to 30,245 million SEK over the period of 1986 to 2017. Even though the stock has yielded a negative return, it has paid out dividends greater than the decline in share price

Research on the US and Norwegian stock markets conclude that just a fraction of all companies actually accumulate wealth in excess of the risk-free rate[27].

[27]Both Bessembinder and Norang & Agustsson presented such findings. In fact, only 4.31% of the stocks on the U.S. market stood for all the wealth that was created from January 1926 to December 2015 (Bessembinder, 2018)

Table 4.4.1: Summary of Wealth Creation, all Markets

	UK (MGBP)	**Japan (MYEN)**	**Germany (MEUR)**	**France (MEUR)**	**Italy (MEUR)**	**Sweden (MSEK)**
Gross total wealth created	2,810,746	453,192,274	1,640,556	2,014,901	505, 624	7,600,660
Net total wealth created	2,221,760	250,862,003	685,639	1,655,489	149,989	7,154,372
Wealth destroyed	588,986	202,330,272	954,917	359,412	355,635	446,288
Mean	497	48,420	450	948	243	7,028
Median	-6	-447	-11	1	-48	12
# of companies with positive wealth creation	1,899	2,520	636	892	218	523
# of companies with negative wealth creation	2,568	2,661	887	854	398	495
Average lifetime (years)	10 $\frac{1}{2}$	18	12 $\frac{1}{2}$	10 $\frac{1}{2}$	11 $\frac{1}{2}$	8

1. The table displays a summary of the wealth creation made in UK, Japan, Germany, France, Italy and Sweden. Net total wealth creation is equal to the gross total wealth creation made at each country minus the wealth destroyed. The numbers are in each country's currency. Hence the absolute numbers are not comparable.

Table 4.4.1 presents summary statistics on wealth creation for all covered stock markets over the 32-year sample period. Notably, some markets have destroyed substantial amounts of wealth, relatively. Especially Italy stands out with an accumulated wealth destruction more than twice the net wealth creation[28]. Of the better performing markets, we point to France and Sweden, which are the only markets where the majority of companies have created positive wealth.

First, the methodology is introduced, before we present the results and argue the effect of information.

4.4.1 Methodology

Calculation of company wealth creation is executed in lines with the framework of Bessembinder (2018). Assume an investor has an initial wealth of W_0. He invests his wealth in either risky equity, I_t, or risk-free bonds, B_t, in each period in timespan, T. His wealth at any period, t, is therefore:

$$W_t = I_t + B_t \tag{20}$$

[28]Gross wealth creation net of wealth destruction

The bond pays a known return, R_{ft}, while the risky equity pays an uncertain return:

$$R_t = R_{ct} + R_{dt} \tag{21}$$

The return is twofold consisting of a capital gain, R_{ct}, and a dividend gain, R_{dt}. Any dividend gain is then reinvested in bonds. Regardless of dividends, the investor can at any time reallocate F_t from the bond account to the equity account. Such an example could occur if the firm conduct a share repurchase (in that case $F_t < 0$). The value of the bond and equity account can then be denoted as:

$$I_t = I_{(t-1)}(1 + R_c t) + F_t \tag{22}$$

$$B_t = B_{(t-1)}(1 + R_{ft}) + I_{(t-1)} \times R_{dt} - F_t \tag{23}$$

Combining equations (20), (22) and (23), we get:

$$W_t = I_{(t-1)}(1 + R_t) + B_{(t-1)}(1 + R_{ft)} \tag{24}$$

The output is intuitive – the wealth in period t depends on the ingoing value in both accounts, multiplied by their respective periodical return. One can further express the *excess* wealth gain over a period, that is the surplus generated from not solely investing in the risk-free bond:

$$W_t - W_{(t-1)}(1 + R_{ft}) = I_{(t-1)}(R_t - R_{ft}) \tag{25}$$

The periodical excess wealth creation is simply the equity excess return multiplied by the ingoing period equity account. Notably, function (25) is only indirectly dependent on dividends and share repurchases because it is represented through the subsequent period's equity account, I_{t-1}.

Furthermore, we introduce the forward compounded value of a bond, $FV_{t,T}$, from period t to T:

$$FV_{t,T} = (1 + R_{(ft+1)}) \times (1 + R_{(ft+2)}) \times \cdots \times (1 + R_{fT}) \tag{26}$$

$FV_{t,T}$ is then used to express the accumulated excess wealth created for all investors in each stock, in time T currency. This is a clever approach Bessembinder applies to make

the wealth creation analogous across time. The finalized formula comprises equation (25) and (26):

$$W_T - W_0 \times FV_{0,T} = I_0(R_1 - R_{f1})FV_{1,T} + I_1(R_2 - R_{f2})FV_{2,T} + \cdots + I_{(T-1)}(R_T - R_{fT}) \quad (27)$$

The left-hand side of the equation is simply the investor's surplus wealth in time T compared to solely investing the initial wealth in the risk-free asset over the same period. The right-hand side is the sum of all periodical excess returns compounded forward to time T. The output is therefore expressed as a time T currency amount. Note that the wealth creation is calculated from the first observation, or the beginning of the sample, until delisting or the end of the sample. This means that any wealth created before 1986 is not included.

Because the ingoing period's market capitalization is used as I_t, the output represents the excess value created for all investors in each stock. Further, conforming to Bessembinder, it is natural to present the wealth creation at a company level. Thus, companies with more than one issued share, are measured by the aggregate wealth creation across all stocks. For example, Volvo AB has several $SEDOL$ codes under the same $GVKEY$. These are summarized to comprise total wealth creation for the company Volvo AB.

For comparable reasons, we have included annualized returns of the lifetime buy-and-hold returns from section 4.1, using the geometric average method:

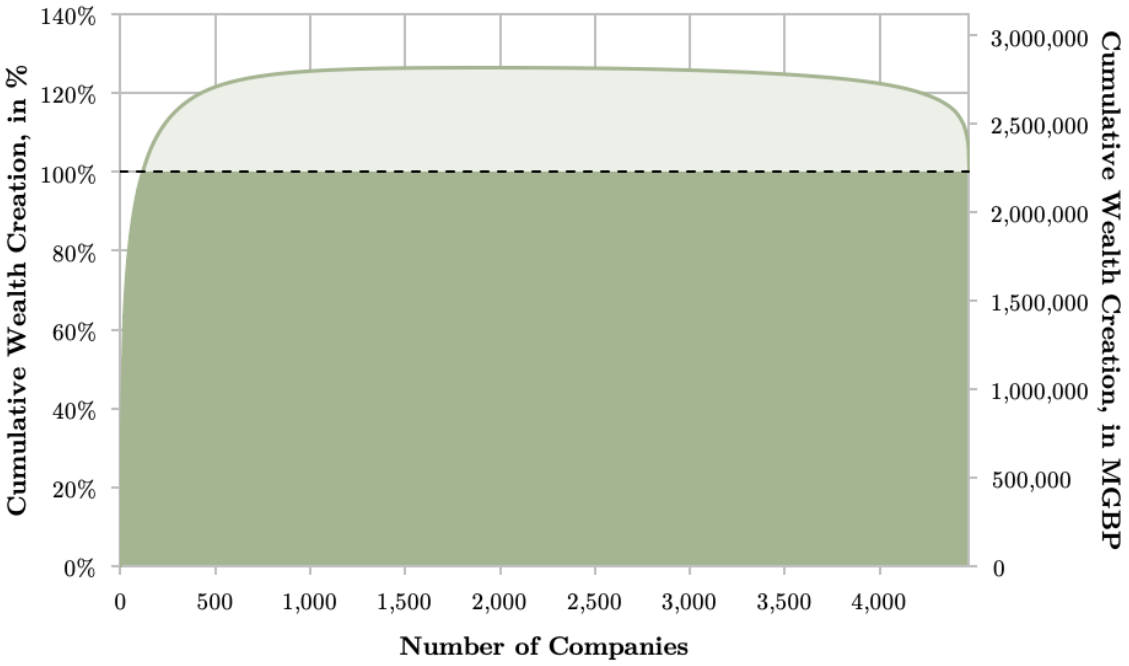
$$AR = (1 + BaHR)^{\frac{12}{n}} - 1 \quad (28)$$

For companies with more than one stock, the one with the longest lifetime is used. Note further the fundamental difference in methodology; because the latter method is based on gross returns, companies with positive annualized returns can still have negative wealth creation.

4.4.2 Empirical Results

United Kingdom

Figure 4.4.1: Wealth Creation in the British Stock Market



1. Overview of the cumulative lifetime wealth creation for all companies that have been listed on the British stock market from 1986-2017.

2. Companies are sorted from largest to smallest wealth creation

Out of the 4,467 companies that have been listed on the British stock market, 117 (2.6%) have created 100% of the total net wealth. The remaining companies have in aggregate produced returns equal to the Treasury bills. This illustrates how concentrated the British stock market is. Over the sample period, the British stock market has accumulated wealth adding up to 2,221,760 million GBP. The fact that gross wealth creation tops out just above 120% of net wealth creation, suggest modest levels of wealth destruction. Still, the majority of companies in the UK, 57.5%, have created negative wealth.

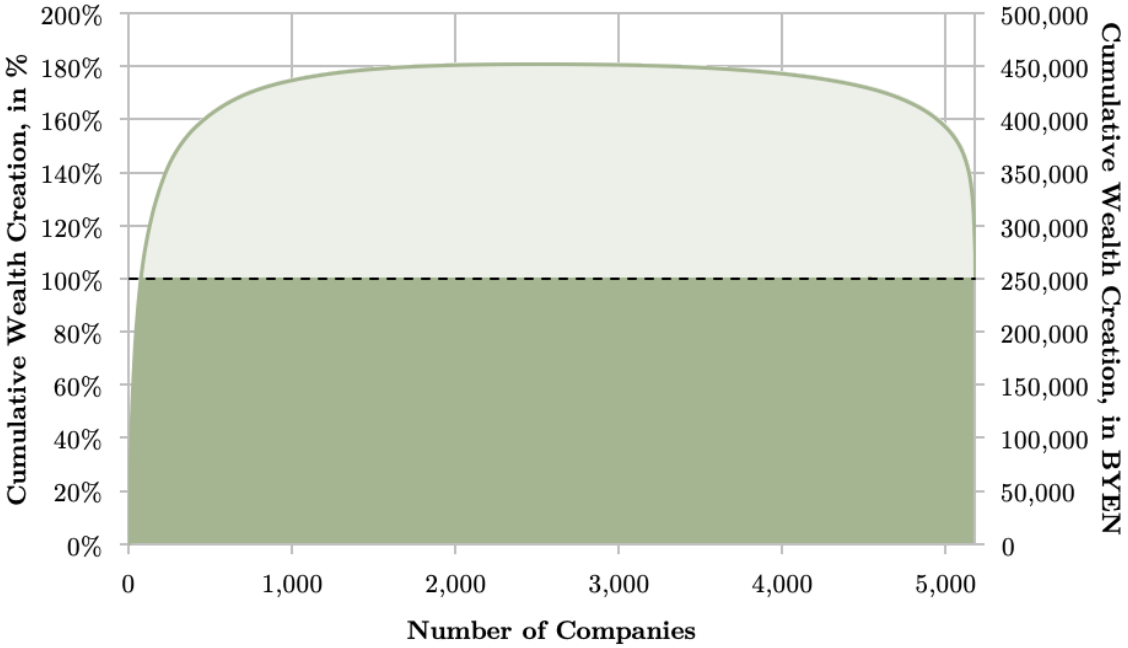
HSBC has generated the highest lifetime wealth creation in the UK, followed by British American Tobacco and Royal Dutch Shell. The top ten companies constitute 43.2% of all net wealth created on the British stock market[29]. At the bottom, we find Vodafone Group followed by Royal Bank of Scotland and HBOS. Vodafone has destroyed wealth amounting to 49,145 million GBP over the sample period.[30]

[29] Appendix F: Table F.2

[30] Appendix F: Table F.3

Japan

Figure 4.4.2: Wealth Creation in the Japanese Stock Market



1. Overview of the cumulative lifetime wealth creation for all companies that have been listed on the Japanese stock market from 1986-2017.

2. Companies are sorted from largest to smallest wealth creation

Figure 4.4.2 reveals that the Japanese market is highly consentrated as well. Of all 5,181 companies, 74 of them provide all the net wealth created between 1986 and 2017. Notably, wealth destruction is more prominent in Japan compared to UK. Gross wealth creation peaks over 180%, which implies substantial amounts of wealth have vanished over the last three decades. In the light of Japan's economic condition the last decades, this is not unexpected. Since the Japanese asset price bubble burst in 1990, the economy has struggled. The stock market has yet to recover to the same levels of the late 80's.

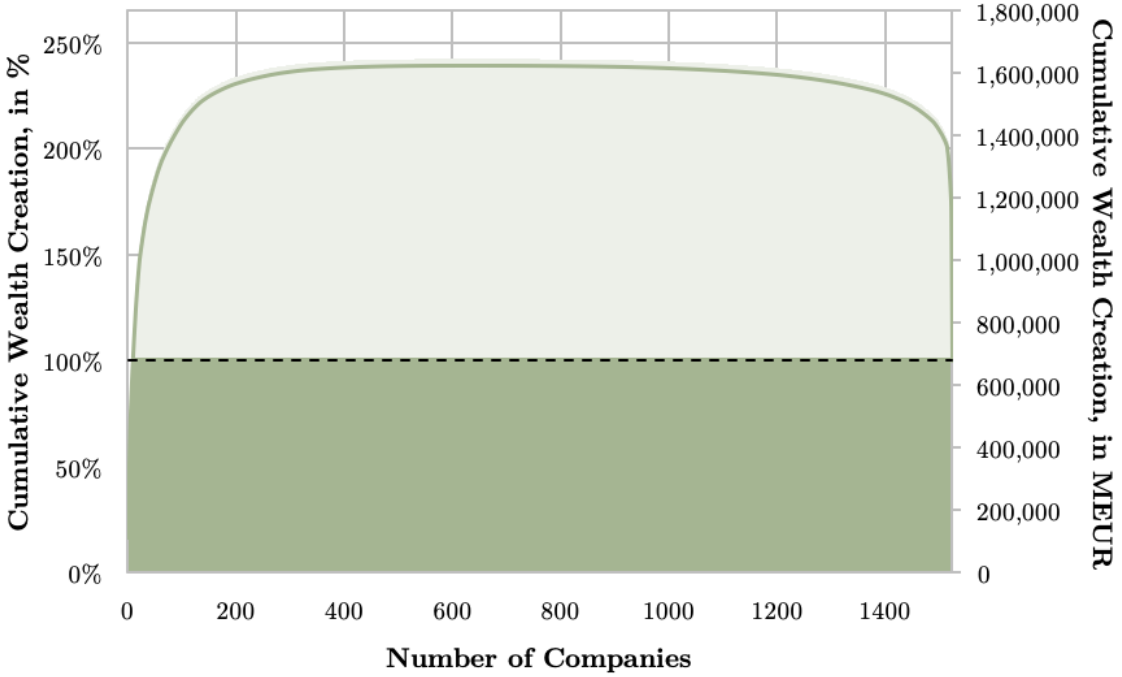
Toyota Motor is by far the top wealth generating company in Japan. The company has single-handedly generated 11% of all net wealth in the sample period. Following Toyota we find Softbank Group and Honda Motor. The top ten companies constitute 36.3% of all wealth created on the Japanese stock market over the sample period.[31] At the bottom, we find Nippon Telegraph & Telephone, which has destroyed wealth amounting to 23,546,062 million YEN (-9.4% of net wealth creation).[32]

[31] Appendix F: Table F.4

[32] Appendix F: Table F.5

Germany

Figure 4.4.3: Wealth Creation in the German Stock Market



1. Overview of the cumulative lifetime wealth creation for all companies that have been listed on the German stock market from 1986-2017.

2. Companies are sorted from largest to smallest wealth creation

Germany has had a gross wealth creation close to 250% of the net wealth creation. Thus, German stocks have destroyed more wealth than they are left with. In the light of the financial crisis of 2007-2008, the German economy and stock market were one of the European countries which were hit the hardest. A company like Deutsche Bank, previously one of the largest banks in the world, has not recovered from 2008, and is still having severe problems. The German stock market is also indeed very concentrated. Out of the 1,523 companies, just 11 (0.7%) of the companies have accumulated the total net wealth creation.

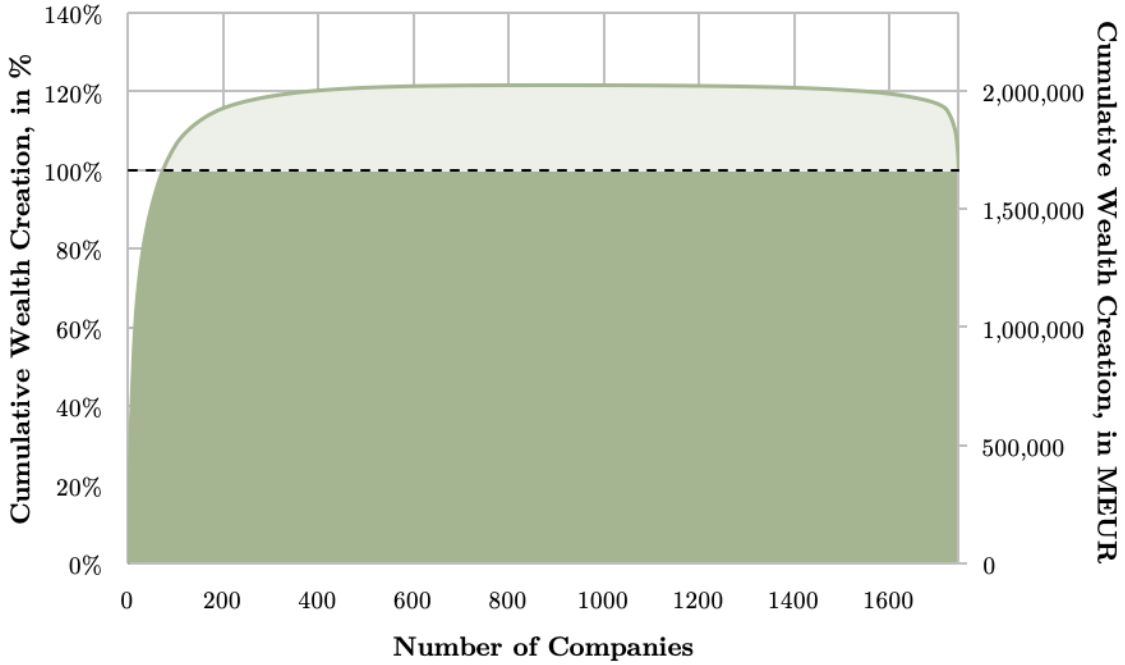
The top three companies in Germany, consisting of BASF, SAP, and Bayer, have created a staggering 44% of the total net wealth.[33] However, because the wealth destruction has been substantial, the biggest contributors will make up a larger fraction of the net wealth creation. Some of the current and previous major banks and industrial companies have strongly impacted the wealth destruction after the financial crisis in 2008. What characterize some of them is that they either were acquired at a vulnerable state, or they still struggle today. This is the case for Deutsche Bank, HypoVereinsbank and T-

[33]Appendix F: Table F.6

Online[34]. In fact, by removing the top three wealth destroyers, the wealth destruction drops by 78.4%

France

Figure 4.4.4: Wealth Creation in the French Stock Market



1. Overview of the cumulative lifetime wealth creation for all companies that have been listed on the French stock market from 1986-2017.

2. Companies are sorted from largest to smallest wealth creation

France, together with Sweden, are the only countries where most of the firms have generated positive wealth. Out of the 1,746 companies that have been listed over the sample period, 892 (51.1%) have contributed with a positive wealth creation. The French stock market has created a total net wealth of 1,655,489 million EUR, made up by 4.2% of the companies. The top three performing companies, LVMH (8.2%), Total (7.8%) and L'Oréal (7.6%) has created 23.6% of the total net wealth.[35]

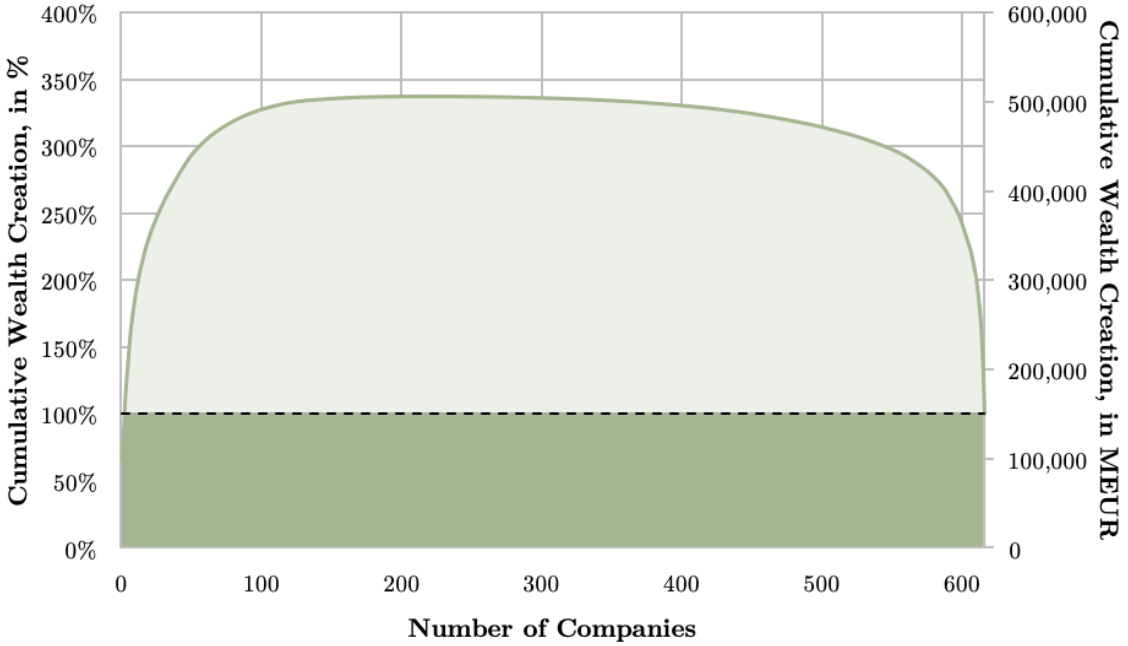
Moreover, the French market has had a total gross wealth creation equivalent to 121.7% of total net wealth creation. In contrast to Germany, these numbers are substantially lower, emphasizing how France was not nearly as affected by the global financial crisis. An important factor could be that the French banks better withstood the crisis that particularly upset the financial sector.

[34]Appendix F: Table F.7

[35]Appendix F: Table F.8

Italy

Figure 4.4.5: Wealth Creation in the Italian Stock Market



1. Overview of the cumulative lifetime wealth creation for all companies that have been listed on the Italian stock market from 1986-2017.

2. Companies are sorted from largest to smallest wealth creation

Italy, another big player in EU, has struggled with soaring debt and political turbulence the last years. The trouble is clearly mirrored in Figure 4.4.5. Notably, the stock market has destroyed over twice as much wealth as the outgoing levels in 2017. It is important to point to the fact that the Milan Stock Exchange is known for consisting of mainly small firms (Brighi and D'Addona, 2008). Small firms have a higher beta (Fama and French, 1993), thus only a few firms are likely to generate high returns, while most firms fail to do so. Combined with the fact that some major companies, like Unicredit, still struggle compared to their pinnacle in 2007, could explain the severe wealth destruction.

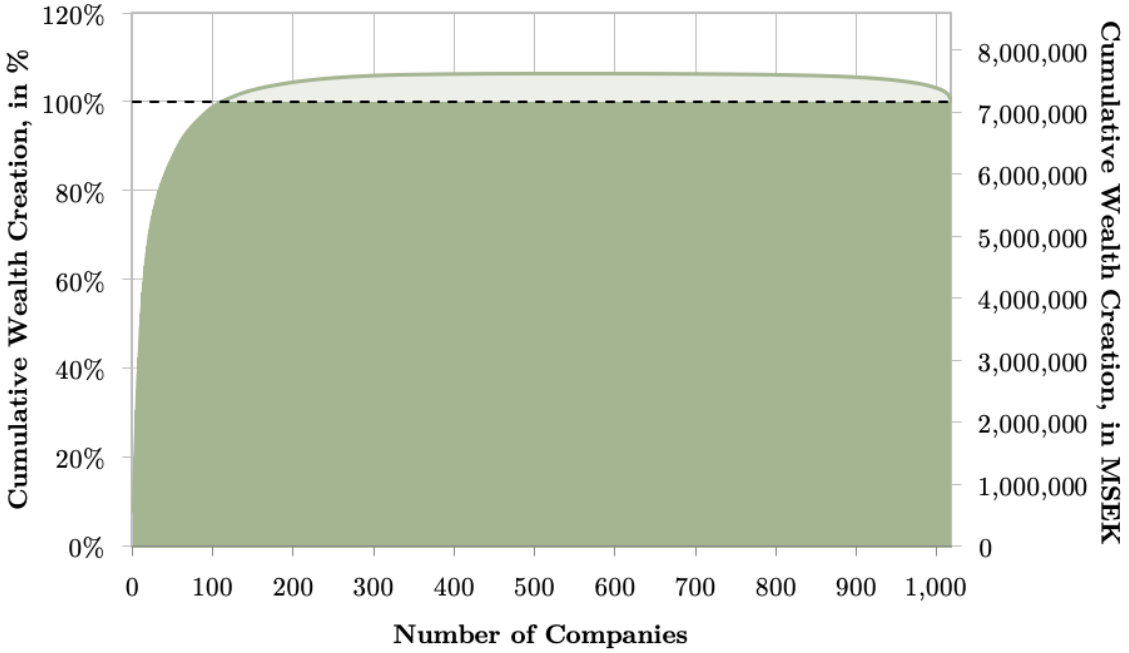
With this in mind, it is not too surprising that some of the large firms constitute a relatively large share of the wealth creation. The top performing company ENI, one of the world's largest oil and gas companies, stands for 65% of the total net wealth creation. Including Telecom Italia and Atlantia, the three companies have created all of the total net wealth made on the Italian market from 1986 to 2017[36]. At the bottom, we find Unicredit as the worst performing company, generating a negative wealth of 48,120 million EUR, -32.1% of total net wealth creation[37].

[36] Appendix F: Table F.10

[37] Appendix F: Table F.11

Sweden

Figure 4.4.6: Wealth Creation in the Swedish Stock Market



1. Overview of the cumulative lifetime wealth creation for all companies that have been listed on the Swedish stock market from 1986-2017.

2. Companies are sorted from largest to smallest wealth creation

Lastly, Figure 4.4.6 displays the wealth creation in the Swedish stock market. Relative to the other markets, it appears more fragmented, where 112 (11%) companies have accumulated all the net wealth. Thus, the remaining 906 companies have in aggregate produced returns equal to the Treasury bills. Overall, a total wealth amount of 7,154,372 million SEK has been generated between 1986 and 2017.

Atlas Copco is the top wealth creating company of the Swedish sample, followed by Volvo and Nordea Bank. From Table F.12, we observe that the top ten companies constitute 49% of the total wealth creation. The industry composition reveals an interesting finding. The top companies are dominated by the well-known Swedish banks. In fact, of the top ten, four of them are banks: Nordea Bank, Svenska Handelsbanken, Swedbank, Skandiavisk Enskilda Bank. At the bottom, we find Telia Company, SAS and Song Networks HLDG as the three worst performing firms in terms of wealth creation.[38]

[38]Appendix F: Table F.13

4.4.3 Effect of Information

The markets portray relatively similar patterns. All stock markets are concentrated, where only a small fraction comprise all the net wealth. Italy is the most concentrated market, where 0.5% of the companies have created all of the net wealth. The findings strongly supply evidence to the findings from the buy-and-hold analysis – that a minority of companies makes up for the dismal performance of the rest.

The wealth destruction is prominent in all markets, though at significantly deviating levels. Italy, Germany and Japan have experienced the largest amount of wealth destroyed over the sample period. These findings are arguably not unexpected as it largely portrays the reality the economies have faced. The Japanese economy has struggled ever since the pinnacle in 1989. Similarly, Italy has gained extensive amounts of debt and has struggled with high unemployment rates. The German economy has in many aspects been strong in recent time, but the financial crisis in 2007-2008 made a big impact on the German stock market.

It is important to keep in mind that some degree of concentration in the stock markets is expected (Bessembinder, 2018). Variations in firm size and lifetime will consequently impose differences in the wealth creation. As we found, monthly returns are skewed, and the compounding effect induces skewness over longer time periods. These effects are likely to support each other and influence the market concentration. For example, a company with a high positive return is more likely to grow large and live longer, compared to a firm of the opposite. Regardless, the degree of concentration is staggering. Whether the same degree of concentration is consistent across different sectors would be interesting to assess further.

Comparing the lifetime wealth creation with the US and Norwegian markets, we recognize the same patterns. Similar to the Italian market, the Norwegian market stands out in terms of the extensive value creation by the top three companies (Norang and Agustsson, 2018).

The US stock market, as the worlds largest, is home to several major companies. Exxon Mobil Corporation, no. 1 in the US, stood for 2.9% of the total wealth creation between 1926 and 2016 (Bessembinder, 2018). This is considerably smaller than the other markets' no. 1, implying that the (top) US stock market is more fragmented, where the wealth creation is more evenly distributed among the top performing companies. Still, the Swedish market is the most fragmented, with about 11% of all companies providing the net total wealth creation.

5 Implications of the Findings

Findings from the conducted analysis can be interpreted in several ways. It is therefore necessary to assess the concrete effects the findings pose. Specifically, we will evaluate consequences with regard to diversification and portfolio management.

5.1 Implications on Diversification

The thesis does to a large extent provide support to already known benefits of diversification. Especially the relationship between returns and variance is well documented. The results from the bootstrap analysis reveal that both mean return and the standard deviation is reduced when increasing the number of stocks in the portfolio. In fact, the Sharpe ratio[39] is larger for the most concentrated portfolios in all markets and horizons[40]. In the light of portfolio theory, the 100-stock portfolio is therefore closer to resemble the *market portfolio*.

Notably, our findings do in fact provide new meaningful insight to the topic of diversification. Specifically, it builds on the discoveries first presented by Bessembinder. He argued that the degree in which stock returns are positively skewed strengthens the necessity of diversification for the average investor. This is best illustrated by the frequency distributions in section 4.1.2 (and Appendix C: Figure C.4). As the horizon increases, the most frequent return observation is practically -100%. Thus, for an average investor, a single-stock strategy will, over time, most likely lose him his money. Because the majority of buy-and-hold returns also underperform the VW and EW market portfolios in all markets and horizons, the odds of beating the market benchmarks will increase with the portfolio size.

5.2 Implications on Portfolio Management

So, how should an investor adapt his portfolio strategy based on the findings? The assertions above seem rather pronounced – investors should be fully diversified. However, the answer is not that simple. As mentioned, this applies to the *average* investor. That is investors who do not have a superior edge in stock picking.

The skewness in stock returns poses two potential pitfalls for non-diversified investors.

[39] Risk-return measurement by Sharpe (1994)

[40] The 100-stock portfolio provided superior Sharpe ratio in all cases except for Japan at the annual horizon, where it was marginally (0.3%) higher than for the 50-stock portfolio

First, the chances of picking underperforming stocks are higher than the opposite. Compounding the returns over multiple periods, will therefore most likely yield inferior returns. Secondly, poorly diversified portfolios run the risk of not holding the small fraction of top performing stocks. Hence, missing out on these will significantly reduce the portfolio returns. With reference to portfolio theory and the Sharpe ratio, the best strategy for the average investor is arguably to hold a fully diversified portfolio and leverage it accordingly, to meet the desired risk exposure.

For investors who claim to have an edge in stock picking, whether it stems from intellect or other differentiating resources, the strategy above might not be optimal. This arises from the fact that diversified portfolios, on average, yield inferior returns compared to less diversified portfolios. Thus, investors that are able to successfully pick the small fraction of rewarding stocks, should most likely continue with this strategy. Because a diversified portfolio will in such case dilute the returns from the winning stocks.

Alternatively, a reversed methodology could be beneficial for some, assuming some investors find it easier to identify the losing stocks. Rather than trying to pick the few winners, one can simply try to exclude some of the many losers.

Research conducted by Kacperczyk et al. (2006) disclose that most mutual funds underperform the corresponding benchmarks. It is therefore likely that many investors incorrectly claim to have an edge in stock picking. One can argue that the skewness metric should be included when evaluating the performance of fund managers. As we have seen, it does provide a new valuable dimension to the understanding of stock returns.

6 Limitations & Further Research

In the following section, we present the apparent limitations of the thesis, as well as suggestions for further research on the topic. Some of the limitations have been touched upon previously, thus this section will sum up what we consider to be most essential.

The thesis has certain limitations when it comes to the time horizon and the quality of the data set from Compustat. A time frame of 32 years should in most cases be sufficient, but for the analysis on decade returns, it restricted us to only three full decades. In comparison, Bessembinder had a time span of 90 years from the CRSP database, and could therefore analyse nine full decades. This gives him a more solid data basis when computing the decade buy-and-hold returns. With only three decades, one abnormal decade could have strong impact on the results.

The CRSP data set used by Bessembinder is known to be of high quality. The data set retrieved from Compustat cannot be said to be of the same quality. This especially applies for stock prices at the beginning of the sample period in 1986. Consequently, there were some missing observations in all six markets. Therefore, some stocks were dropped[41] or adjusted. Still, we argue the magnitude of the sample content makes the missing observations negligible and the analysis as a whole provides credible results. This is supported by the fact that it largely shares the same characteristics as Bessembinder's results.

Bessembinder pointed out that stocks listed after 1967 were excessively represented in the low-performing section. Since our data set begins in 1986, we were not able to test this hypothesis. It is also documented that stocks listed between 1980 and 2001 had a higher delisting rate than stocks in earlier periods (Fama and French, 2004).

The Japanese stock market experienced remarkable growth until the asset price bubble burst in 1990. Since then, the country has struggled to retain the same growth. With data from 1986 most of the *good* years are left out. It would therefore be interesting to see whether the results would differ if the sample length was expanded. That being said, the sample period of 32 years captures some growth in the late 80's as well as late 2010's. Inevitably, it reflects the reality investors have faced the last three decades and should therefore not be neglected.

The thesis initiates several topics which would be of interest to delve further into. First of all, the origin of positive skewness observed in stock returns are still a relatively disclosed area. Bessembinder provided interesting evidence with regards to mostly statistical

[41] Information about the stocks that have been dropped can be found in Appendix B.

causes[42]. However, the findings from our thesis clearly imply that fundamental economical factors also impact the skewness. Further research on this area would therefore provide useful insights.

To date, research on the topic has solely covered developed markets. It would be interesting to adapt the methodology on emerging markets, and see if the same findings are present. How do individual stock returns in emerging markets compare against Treasury bills, and further how concentrated is the wealth creation? Emerging markets often deviate with regards to economic metrics, do the same apply in this case?

The fact that most stock returns fail to beat the risk-free rate and benchmarks, can give new insight for portfolio management. The common practice for portfolio managers is trying to pick the few winners. An alternative approach could rather be to conduct the reverse strategy, where one starts off with a broad portfolio and eliminates the losers. Because there are a lot more losers than winners, the odds will be in his favor. To our knowledge, extensive research on such strategy does not exist. In addition, research on the relationship between skewness and active portfolio performance, is a rather undisclosed topic. Findings could be of great value for future portfolio management.

[42]E.g. the effect on multi-period returns, when normally distributed single-period returns are compounded

7 Concluding Remarks

Investments in the value weighted market portfolios in UK, Japan, Germany, France, Italy and Sweden have generated between 1.3x and 11.3x the returns[43] which would have been obtain from investing in the corresponding Treasury bills in the period 1986-2017. The track record of stock markets is without doubt impressive. Even the Japanese market, which has experienced its two worst decades during the sample period, has clearly yielded superior return. Despite this, managers of mutual funds claim their expertise in actively seeking alphas can provide even higher returns. A deep dive in individual stock performance suggests the odds are against them.

Of all British, German, Italian and Swedish common stocks that have appeared in the Compustat Global database, less than half yield lifetime buy-and-hold returns exceeding the matching Treasury bills. Japan and France are the only two stock markets where the majority of stocks generate positive excess returns. Margins of 51.7% and 51.2%, respectively, are still not overwhelming. Regardless, the fact that only two out of eight[44] covered markets manages to outperform Treasury bills is fascinating.

The cause of the two deviating results cannot be solely attributed to one single factor. Nonetheless, we point to some possible explanations. In the case of Japan, the Government's substantial fiscal stimulus has resulted in plummeting interest rates, which most likely interfered with some of the stocks' lifecycle. France, as a co-member of EU, may have experienced a lower key rate than the stand-alone market would imply. This could explain the larger spread between the market growth and Treasury rates.

At annual and decade horizons, the results are somewhat different. Measured over decades, France and Sweden are the only markets where the majority of stocks generate a higher return than the Treasury bills. At the annual horizon, the majority of stocks in all markets[45] except Germany and Italy yield positive excess returns.

Underperformance is prevalent for all markets at the monthly horizon. Again implying that only a minority of stocks are reliable for the collective stock markets' thrive over the last three decades. The finding itself might not be surprising, however, the extent to which the distributions are skewed is noteworthy.

The measure of wealth creation supports the assertion that equity markets' success is highly concentrated. In Germany, out of the 1,523 companies, just 11, or 0.7%, account

[43] Buy-and-hold returns (including reinvestment of dividends)

[44] US, Norway, UK, Japan, Germany, France, Italy, and Sweden. Note that the US market differ in the length of the sample period (1926-2016)

[45] Including US and Norway

for all the net wealth creation accumulated over the 32-year sample period. The remaining 98.6% of the companies have in aggregate matched the Treasury bills. Italy is even more concentrated where 0.5% account for all the net wealth created over the sample period. In UK, Japan, France and Sweden all net wealth creation is accumulated by respectively 2.6%, 1.4%, 4.2% and 10.9% of the companies.

In terms of wealth destruction, the degree of concentration is less prominent. Notably, the German and Italian stock markets have destroyed wealth equivalent to respectively 139.3% and 237.1% of the total net wealth creation. Comparing the numbers to that of UK (26.5%), Japan (80.7%), France (21.7%) Sweden (6.2%), US (15.0%) and Norway (42.1%), suggest that Germany and Italy are extraordinary cases.

The wealth destruction is somewhat reflecting the course of the economy. Italy has struggled with soaring debt levels and political distress. Because the Milan Stock Exchange is known for largely consisting of smaller stocks, it could justify sensitivity to the challenging conditions. The excessive wealth destruction in Germany can to some degree be attributed to a few major banks and industrial companies being severely rocked by the financial crisis in 2008.

The wealth creation analysis illustrates the relatively large concentration of well performing stocks. The results from the conducted bootstrap simulation further highlights the importance of diversification in order to capture the relatively few winners. The more stocks investors include in their portfolio, the more likely it is to outperform Treasury bills and index portfolios. Because actively managed portfolios tend to be more concentrated, it may disclose why most funds underperform market benchmarks (Kacperczyk et al., 2006). As such, the findings suggest that diversification is a necessity for most investors. Contrarily, for investors with superior competence and resources, which provide an edge in picking winning stocks, diversification may dilute the payoff.

In accordance with Bessembinder, the findings highlight the level in which distributions of multi-period stock returns are positively skewed. The skewness in multi-period returns is in part caused by skewness in single period returns. It is also attributable to the compounding of volatile stocks and limited liability. In addition, our findings point to the possible implications of fundamental economical factors on skewness. Best exemplified by Japan, where strong governmental interference has backed the worst performing companies. Consequently, the otherwise struggling stock market has the lowest share of companies yielding -100% returns[46]. This may again be an explanation for the relatively large fraction of stocks beating the Treasury bills.

[46]Binned by 10%, such that -100%-bin include all returns less than -90%.

As to the main question: *Do all stocks fail to outperform Treasury bills?* – Well, that depends. Our findings suggest there is not *one* clear answer to the question as it varies depending on which market and horizon one assesses. Looking beyond the binomial question, the results reveal strong similarities across all stock markets.

Our findings largely mirror the distribution characteristics seen in the US and Norwegian stock markets, where the majority of stocks yield inferior returns compared to market benchmarks. Thus, it is evident that the characteristics, to a large extent, apply to equity markets at a universal level. The fact that these results prevail may not come as a surprise to most. We are after all in the midst of a world where financial markets are at the very forefront of globalization.

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Appendices

A Context

Table A.1: Bessembinder: Multi-Period Simulations from Normally Distributed Returns

Standard deviation of monthly return	0.0%	2.0%	4.0%	6.0 %	8.0%	10.0%	12.0%	14.0%	16.0%	18.0%	20.0%
Horizon (Years)	Panel A: Skewness of buy-and-hold returns										
1	0	0.188	0.385	0.579	0.779	0.997	1.222	1.471	1.724	2.014	2.306
5	0	0.46	0.959	1.549	2.322	3.314	4.57	8.352	9.44	15.196	23.814
10	0	0.667	1.478	2.618	4.655	8.55	11.058	23.849	61.148	42.597	53.323
	Panel B: Median buy-and-hold return										
1	6.17 %	5.94 %	5.24 %	4.11 %	2.46 %	0.48 %	–1.94%	–4.83%	–8.02%	–11.71%	–15.55%
5	34.89 %	33.30 %	28.76 %	21.42 %	11.57 %	0.36 %	–12.18%	–25.19%	–37.98%	–50.32%	–61.04%
10	81.94 %	77.72 %	65.60 %	47.33 %	24.32 %	0.14 %	–23.48%	–44.56%	–61.98%	–75.74%	–85.28%
	Panel C: Percentage of buy-and-hold returns that are positive										
1	100.00 %	79.77 %	64.39 %	57.69 %	53.49 %	50.56 %	48.14 %	46.00 %	44.12 %	42.31 %	40.73 %
5	100.00 %	96.82 %	79.27 %	66.12 %	56.99 %	50.18 %	44.55 %	39.66 %	35.37 %	31.37 %	27.93 %
10	100.00 %	99.57 %	87.49 %	72.09 %	59.68 %	50.05 %	42.06 %	35.24 %	29.47 %	24.20 %	20.02 %
	Panel D: Ninety-ninth percentile buy-and-hold return										
1	6.20 %	24.20 %	44.60 %	67.10 %	92.10 %	120.10 %	150.80 %	184.80 %	221.50 %	261.50 %	304.70 %
5	34.90 %	90.50 %	163.10 %	255.20 %	366.50 %	498.80 %	655.10 %	819.30 %	1017.90 %	1205.50 %	1414.70 %
10	81.90 %	194.80 %	355.90 %	577.20 %	839.20 %	1168.80 %	1525.00 %	1915.30 %	2258.90 %	2485.70 %	2726.60 %

1. Monthly returns are random draws from a normal distribution with mean 0.5% and standard deviation as indicated. Buy-and-hold returns are created by linking monthly returns for the indicated horizon. Results reported are computed across 2.5 million non-overlapping annual returns, 500,000 non-overlapping five, and 250,000 non-overlapping ten-years returns (Bessembinder, 2018)[47].

[47]The original table and description can be found in the appendix of Bessembinder's paper

B Data

Table B.1: Removed Stocks, UK

Company Name	Stock ID (SEDOL)	Company ID (GVKEY)	Cause for deletion
ASA RESOURCE GROUP PLC	9289	210842	Lack of observations
AMALG METAL CORP	24602	210845	Lack of observations
BTP PLC	67339	101078	Lack of observations
BAA PLC	67362	101240	Lack of observations
NEW ENGLAND PROPS	111117	204070	Lack of observations
EXEL PLC - OLD	141460	15179	Lack of observations
CLARK(C.&J.)	200811	212281	Lack of observations
AMEC FOSTER WHEELER PLC	208882	100363	Lack of observations
VIRIDIAN GROUP PLC	226679	208745	Lack of observations
DAVIDSON PEARCE GP	256438	100198	Lack of observations
FARNELL FINANCE	331818	212282	Lack of observations
FULLER SMITH & TURNER PLC	355250	101871	Lack of observations
GPA GROUP PLC	356811	25843	Lack of observations
GENESIS CONDOR FUND LTD	363491	220766	Lack of observations
MOORGATE GROUP	370509	205259	Lack of observations
AIB GOVETT INTL GROWTH FUND	371182	237220	Lack of observations
AIB GOVETT INDIA FUND	378923	221235	Lack of observations
GREAT PORTLAND ESTATES PLC	385213	15696	Lack of observations
INVESTEC WORLD MARKETS PORTF	397069	220774	Lack of observations
HAYS PLC	416113	102576	Lack of observations
POLAR CAPITAL TECHNOLOGY TR	422024	213511	Lack of observations
JOHNSON FRY SECOND UTILS TST	475761	208449	Lack of observations
LATIN AMERICA FUND	506490	221749	Lack of observations
LINCOLN RECOVERY TRUST	507017	220004	Lack of observations
LONDON CREMATION CO PLC	526249	220014	Lack of observations
THORNTON UNIT MGRS	532871	209035	Lack of observations
M & G DUAL TRUST	550000	208651	Lack of observations
GOVETT ASIAN SMALLER COS INV	557830	221234	Lack of observations
MERRETT HLDGS	581099	206363	Lack of observations
MURRAY EUROPEAN FUND	611855	206364	Lack of observations
VIRIDIAN GROUP PLC	647537	208745	Lack of observations
PANTHEON INTERNATIONAL PLC	669531	220772	Lack of observations
PORTH GROUP	695633	204521	Lack of observations
REGIONAL ELEC CO'S	729059	207071	Lack of observations
REGIONAL ELEC CO'S	729060	207071	Lack of observations
REGIONAL ELEC CO'S	729082	207071	Lack of observations
RITZ DESIGN GROUP	741291	207119	Lack of observations
SAVE & PROSPER LINKED INV TR	777489	210718	Lack of observations
SAVE & PROSPER LINKED INV TR	777508	210718	Lack of observations

SCHRODER KOREA FUND PLC	790419	221750	Lack of observations
SECURITY ARCHIVES	792448	208278	Lack of observations
SINCLAIR RESEARCH PLC	810522	221710	Lack of observations
SMITHKLINE BECKMAN	819273	208132	Lack of observations
CITY OF OXFORD GEARED INCOME	830478	224495	Lack of observations
CITY OF OXFORD GEARED INCOME	830489	224495	Lack of observations
THE TAIWAN CAPITAL FUND LTD	872362	210966	Lack of observations
TEMPLETON EMERGING MKTS INV	882736	203948	Lack of observations
TENNANTS CONSOLIDATED PLC	883847	212288	Lack of observations
TENNANTS CONSOLIDATED PLC	883858	212288	Lack of observations
HENDERSON T/R UTM	897837	206362	Lack of observations
TR EUROPEAN GROWTH TRUST PLC	901028	209197	Lack of observations
SVM UK ACTIVE FUND PLC	913692	223544	Lack of observations
WADWORTH & CO	932589	212289	Lack of observations
WADWORTH & CO	932697	212289	Lack of observations
WATER HOLDING COS	941949	209469	Lack of observations
BRUNEL HOLDINGS PLC	963749	101477	Lack of observations
BISHOPGATE GROWTH	1111105	200764	Lack of observations
SCOTTISH & SOUTHERN ENERGY	1265648	103342	Lack of observations
BRISTOL OIL & MINERL	1577569	200818	Lack of observations
MITON INCOME OPPORTUNITIES	3035496	206249	Lack of observations
IMPERIAL BRANDS PLC	3142879	212773	Lack of observations
HAMBROS PLC	9999767	15572	Lack of observations
NORTHERN VENTURE TRUST	B0PR328	211606	Lack of observations
SPORT MEDIA GROUP PLC	B235T97	277504	Lack of observations
COSTAIN GROUP PLC	B242Y47	100088	Lack of observations
DEXION TRADING LTD	B2PXW12	274134	Lack of observations
WIRELESS GROUP PLC	B2RKHC7	209291	Lack of observations
VESUVIUS PLC	B3L8N59	100280	Lack of observations
GREENE KING PLC	B3R6YX2	100506	Lack of observations
INFORMA PLC	B3WJCR6	220601	Lack of observations
U AND I GROUP PLC	B40YYX0	201614	Lack of observations
PENDRAGON PLC	B46RJN8	104796	Lack of observations
RENEWABLE POWER & LIGHT PLC	B4LWV98	281821	Lack of observations
LAND SECURITIES GROUP PLC	B4W8WV4	15602	Lack of observations
WILLIAM HILL PLC	B4YGDC4	251871	Lack of observations
HOLIDAYBREAK PLC	B543R42	103346	Lack of observations
SEGRO PLC	B55NKB9	15644	Lack of observations
AVIS EUROPE PLC	B5WJLD9	100427	Lack of observations
INCHCAPE PLC	B64FWW8	101449	Lack of observations
BLACKROCK NORTH AM INC TRUST	BD032B4	315565	Lack of observations
PANTHERA RESOURCES	BD2B4L0	326220	Lack of observations
SUMO GROUP PLC	BD3HV38	326274	Lack of observations
ABERDEEN STANDARD	BD9PXH4	326190	Lack of observations
TUFTON OCEANIC ASS	BDFC164	326261	Lack of observations

FUSION ANTIBODIES	BDQZGK1	326205	Lack of observations
PENNPETRO ENERGY	BF2K507	326272	Lack of observations
MIRRIAD ADVERTISIN	BF52QY1	326025	Lack of observations
ERRIS RESOURCES LTD	BFN4GY9	326177	Lack of observations
MELROSE INDUSTRIES PLC	BYQLYB3	270654	Lack of observations
CALCULUS VCT PLC	BYQPF34	326335	Lack of observations
SABRE INSURANCE GROUP	BYWVDP4	326143	Lack of observations
PELATRO PLC	BYXH8F6	326206	Lack of observations
PREMIUM UNDERWR.	696807	204523	Insufficient observations

Table B.2: Removed Stocks, Japan

Company Name	**Stock ID (SEDOL)**	**Company ID (GVKEY)**	**Cause for deletion**
CALCEED CO LTD	6164234	225979	Lack of observations
DAIWA BANK	6251341	15662	Lack of observations
LONGCHAMP CO LTD	6524270	226018	Lack of observations
NANOCARRIER CO LTD	B4V3447	288462	Lack of observations
TRADE WORKS CO	BD9P501	325818	Lack of observations
ARUHI CORPORATION	BF25643	313776	Lack of observations
GENIEE INC	BF2GKD3	326075	Lack of observations
MIRAI WORKS INC	BF2TY74	326052	Lack of observations
KANAME KOGYO CO LTD	BF2WQS8	326046	Lack of observations
ABHOTEL CO LTD	BF2WQW2	326048	Lack of observations
IKKA DINING PROJECT CO	BF3T2P7	325902	Lack of observations
OPTIMUS GP CO LTD	BF5R4P3	326244	Lack of observations
GLOBAL LINK MANAGEMENT INC	BFFVSQ4	325937	Lack of observations
LTS INC	BFFVSR5	325931	Lack of observations
HANATOUR JAPAN CO	BFFVSS6	325929	Lack of observations
EOLE INC	BFFVST7	325927	Lack of observations
VISCO TECHNOLOGIES CORP	BFFVSZ3	325935	Lack of observations
SG HOLDINGS CO	BFFY885	325891	Lack of observations
MATSUOKA CORPORATION	BFLTGL3	326077	Lack of observations
SURALA NET CO LTD	BFN1BH8	326074	Lack of observations
KNOWLEDGESUITE INC	BFN1CG4	326060	Lack of observations
MORIROKU HOLDINGS CO LTD	BFNG7Z3	326050	Lack of observations
PREMIUM GROUP CO	BFNH9M7	326245	Lack of observations
OPTORUN CO LTD	BFNHLQ5	326051	Lack of observations

Table B.3: Removed Stocks, Germany

Company Name	Stock ID (SEDOL)	Company ID (GVKEY)	Cause for deletion
DWS GLOBAL NAT RESOURCES EQ	4249326	221473	Lack of observations
KRONES AG	4494397	103269	Lack of observations
KRONES AG	4512697	103269	Lack of observations
MINERALBRUNNEN UEBERKINGEN	4555302	222163	Lack of observations
DRESDNER BANK AG	5305335	15577	Lack of observations
REAL AG	B1Z6GK1	204859	Lack of observations
DMG MORI AG	B3R70K4	101937	Lack of observations
KLOCKNER & CO SE	B3Y3NR3	278310	Lack of observations
TEREX MATERIAL HANDLING	B4KDGF3	278410	Lack of observations
TOGNUM AG	B5TFXH8	285213	Lack of observations
PEACH PROPERTY (DEUTSCHLAND)	B8KF7S7	314050	Lack of observations
BIOTEST AG	BF2JZT3	200759	Lack of observations
ALLGEIER SE	BF4VBW2	238439	Lack of observations
GSW IMMOBILIEN AG	BFDTSB5	297257	Lack of observations
DEUTSCHE INDUSTRIE REIT AG	BFF9MC2	326163	Lack of observations
DEUTSCHE WOHNEN SE	BY7S9X0	245285	Lack of observations
PHILION SE	BYZPXN1	326790	Lack of observations

Table B.4: Removed Stocks, France

Company Name	Stock ID (SEDOL)	Company ID (GVKEY)	Cause for deletion
AMS PACKAGING SA	4001775	220841	Lack of observations
BANQUE RHONE ALPES SA	4108319	223370	Lack of observations
NATEXIS QUANTACTIONS INTLES	4180083	212456	Lack of observations
DEFONTAINE FRERES	4260305	213387	Lack of observations
EDITIONS BELFOND SA	4305682	220918	Lack of observations
ELF ANTARGAZ	4322874	220921	Lack of observations
GROUPE CHATELLIER INDUSTRIE	4377045	246699	Lack of observations
NIRO KESTNER	4490306	213401	Lack of observations
LOOK VOYAGES SA	4548250	243606	Lack of observations
PC WAREHOUSE SA	4678618	211501	Lack of observations
RHONE-ALPES ECU SA	4736390	219665	Lack of observations
STIM D'ORBIGNY	4766427	248052	Lack of observations
CIE FINANCIERE DE SENELLE	4795700	248055	Lack of observations
SOC IMMOBILIERE PAIX DAUNON	4820925	248053	Lack of observations
VERDOME	4929082	248054	Lack of observations

STE POUR INDUSTRIE TRANSPORT	5091719	246703	Lack of observations
GROUPE DUARTE SA	5348664	238757	Lack of observations
TEAM PARTNERS GROUP SA	5523911	236740	Lack of observations
SOURIAU DISTRIBUTION SA	5612949	238781	Lack of observations
CRCAM OISE	5853027	219612	Lack of observations
SOCIETE FINANCIERE DE COMM	5908529	219675	Lack of observations
SANOFI	B02KR51	101204	Lack of observations
BNP PARIBAS	B10NPW2	15532	Lack of observations
AXA SA	B1747F5	63120	Lack of observations
EUROSIC SA	B1YQ709	211486	Lack of observations
OFI PRIVATE EQUITY CAPITAL	B1YYVG7	246694	Lack of observations
ADVICENNE S.A.	BF2TXZ5	326067	Lack of observations
AIR MARINE	BFF1V21	326151	Lack of observations
NEXANS	BFRTDQ1	246217	Lack of observations
LVMH MOET HENNESSY LOUIS V	BYQ17S1	14447	Lack of observations
SOCIETE D EDITION DE CANAL P	BZ1JLN0	102647	Lack of observations
AGROSPHERE	4546533	248044	Insufficient observations
PATHE SA	4673806	210468	Insufficient observations
SODERAG	4820624	213407	Insufficient observations

Table B.5: Removed Stocks, Italy

Company Name	**Stock ID (SEDOL)**	**Company ID (GVKEY)**	**Cause for deletion**
BIEFFE MEDITAL	4095950	200746	Lack of observations
FINSIDER-STA FIN SIDERURGICA	4339186	202190	Lack of observations
SOCIETA GEN IMMOBIL SOGENE	4366849	202532	Lack of observations
RINASCENTE (LA) SPA	5266681	101149	Lack of observations
BANCA SUBALPINA SPA	7999929	200650	Lack of observations
AUSONIA ASSICURAZIONI	9000034	15723	Lack of observations
CENTRO SERVIZI METALLI SPA	B3LLN81	314035	Lack of observations
UNIONE DI BANCHE ITALIANE	B4L6G73	270266	Lack of observations
UNICREDIT SPA	B5VDG59	15549	Lack of observations
IDEAMI SPA	BD06F92	326175	Lack of observations
GAMENET SPA	BF5L864	315891	Lack of observations
ALKEMY SPA	BFNKN24	326101	Lack of observations
SPACE4 SPA	BYX74J2	326273	Lack of observations
DE ANGELI FRUA	4258838	201586	Insufficient observations

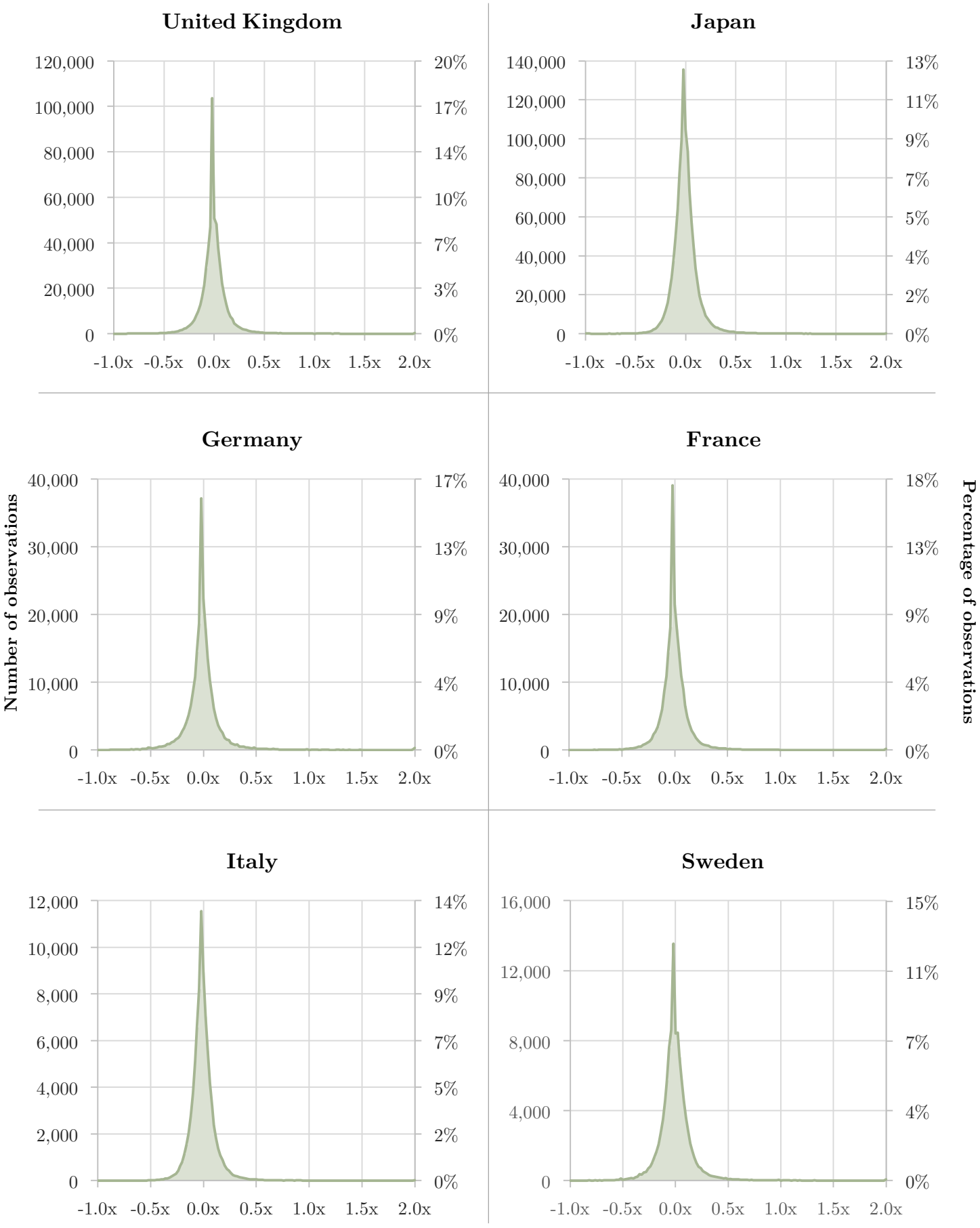
Table B.6: Removed Stocks, Sweden

Company Name	Stock ID (SEDOL)	Company ID (GVKEY)	Cause for deletion
ALMEDAHL-FAGERHULT	4021171	102195	Lack of observations
JACOBSON & WIDMARK AB	4472627	102339	Lack of observations
SENEA AB	4760991	232148	Lack of observations
VBB GRUPPEN AB	4935937	216866	Lack of observations
STORA KOPPARBERGS BERGSLAGS	9000011	100912	Lack of observations
HUFVUDSTADEN AB	9070907	15922	Lack of observations
SWECO AB	B143D46	229521	Lack of observations
MIDSONA AB	B1MYRV6	234201	Lack of observations
CYBERCOM GROUP AB	B2493X0	236676	Lack of observations
BURE EQUITY AB	B24CS89	221085	Lack of observations
TELIGENT AB	B24DJD4	100341	Lack of observations
SKF AB	B2R8KB1	11749	Lack of observations
SKF AB	B2R9X26	11749	Lack of observations
IBS AB	B39LNF0	213039	Lack of observations
BIOPHAUSIA AB	B3CCYX5	243633	Lack of observations
RNB RETAIL AND BRANDS AB	B3CTC54	250761	Lack of observations
MEDA AB	B3DWY78	217164	Lack of observations
ANNEHEM FASTIGHETER AB	B3F1XB0	284566	Lack of observations
BETSSON AB	B3Q5VL7	245736	Lack of observations
MEDIVIR AB	B3RFNC1	213044	Lack of observations
HEXAGON AB	B3S4MX1	103065	Lack of observations
TRELLEBORG AB	B3Y60G0	101048	Lack of observations
MIDSONA AB	B44XFG3	234201	Lack of observations
ENIRO AB	B45XD13	241562	Lack of observations
KARO PHARMA AB	B4L9Q38	234221	Lack of observations
CISION AB	B4QZRQ1	234224	Lack of observations
HALDEX AB	B4TMSV1	102476	Lack of observations
SWEDISH ORPHAN BIOVITRUM AB	B4V56M5	279143	Lack of observations
MERTIVA AKTIEBOLAG	B4VCM62	256778	Lack of observations
GUNNEBO AB	B4VYWD5	212844	Lack of observations
RORVIK TIMBER SA	B4Y8QB0	210970	Lack of observations
PA RESOURCES AB	B59GC96	252008	Lack of observations
VICTORIA PARK I MALMO AB	B617089	287280	Lack of observations
HUSQVARNA AB	B6266H6	277941	Lack of observations
ELANDERS AB	B63M026	221484	Lack of observations
RUSFOREST AB	B73PVV8	278737	Lack of observations
TELE2 AB	B9B3KT9	222286	Lack of observations
HITECH & DEVELOPME	BD468H7	326279	Lack of observations
ARJO AB	BF17YL3	326164	Lack of observations
SCOUT GAMING GROUP	BF1PMV3	326117	Lack of observations

DEVPORT AB (PUBL)	BF1Q614	326156	Lack of observations
BEIJER ELECTRONICS GROUP AB	BF20TK5	244725	Lack of observations
FLEXQUBE AB	BF2R058	326217	Lack of observations
MAG INTERACTIVE AB	BFB43C8	326172	Lack of observations
ATVEXA AB (PUBL)	BFCLBT1	326209	Lack of observations
ACCONEER AB	BFD4XC6	326191	Lack of observations
LYKO GROUP AB (PUB	BFF5Q06	326195	Lack of observations
AWARDIT AB (PUBL)	BFFF521	326116	Lack of observations
MIRIS HOLDING AB	BSMTG13	313458	Lack of observations
OPUS GROUP AB	BWBXMK5	278623	Lack of observations
TETHYS OIL AB	BYMB5G9	273950	Lack of observations
TEMPEST SECURITY A	BYVHTY4	326137	Lack of observations
COREM PROPERTY GROUP AB	BYVWKN5	247589	Lack of observations
BIO-WORKS TECHNOLO	BYVZW27	326218	Lack of observations
NETENT AB	BYZ2WF7	291480	Lack of observations
EXPORT-INVEST AB	4329262	15797	Insufficient observations

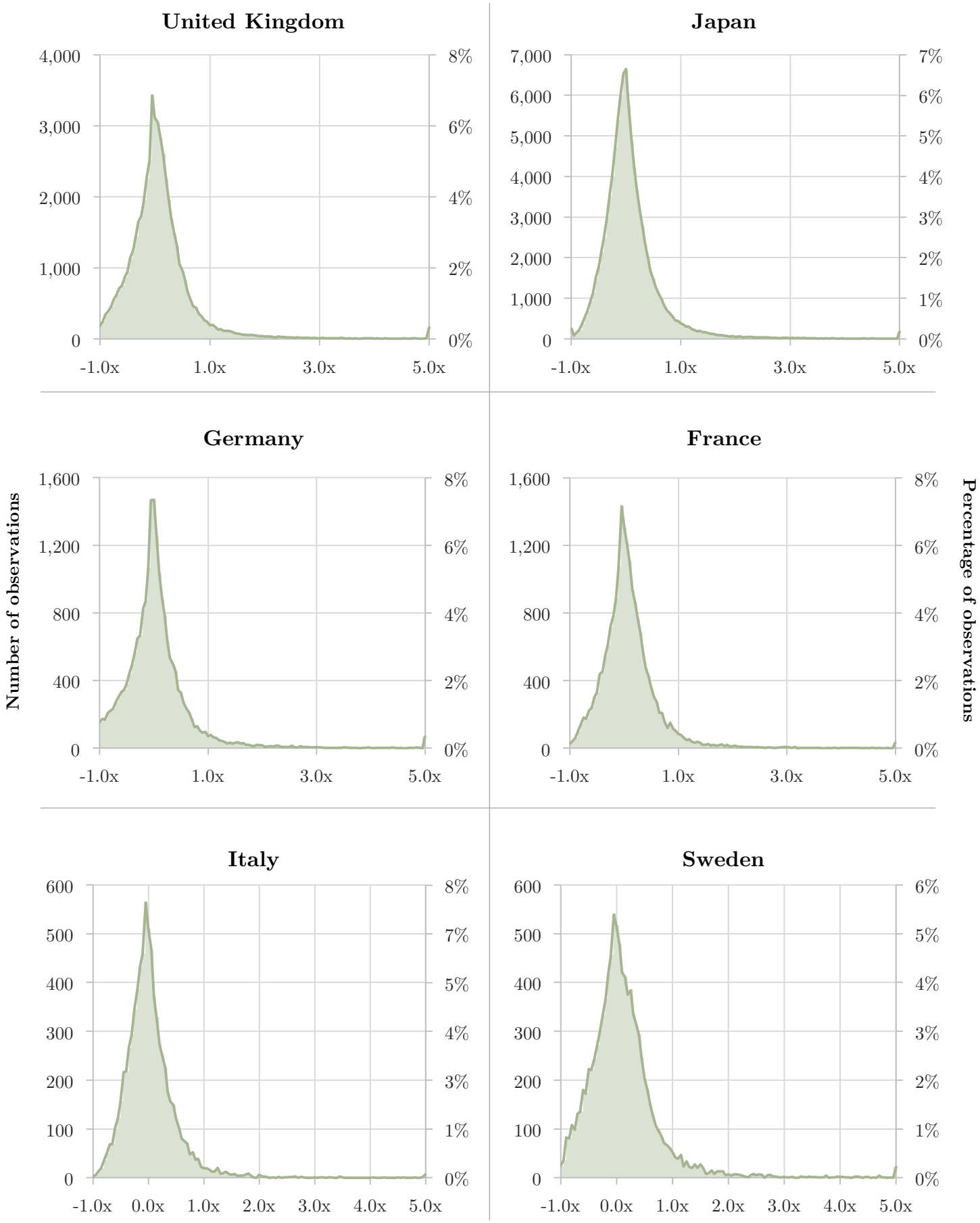
C Analysis: Buy-and-Hold Returns

Figure C.1: Monthly Frequency Distributions of Buy-and-Hold Returns



1. *The figures display frequency distributions for monthly buy-and-hold returns*
2. *Returns are grouped by 2% with an overhead bin at >200%*

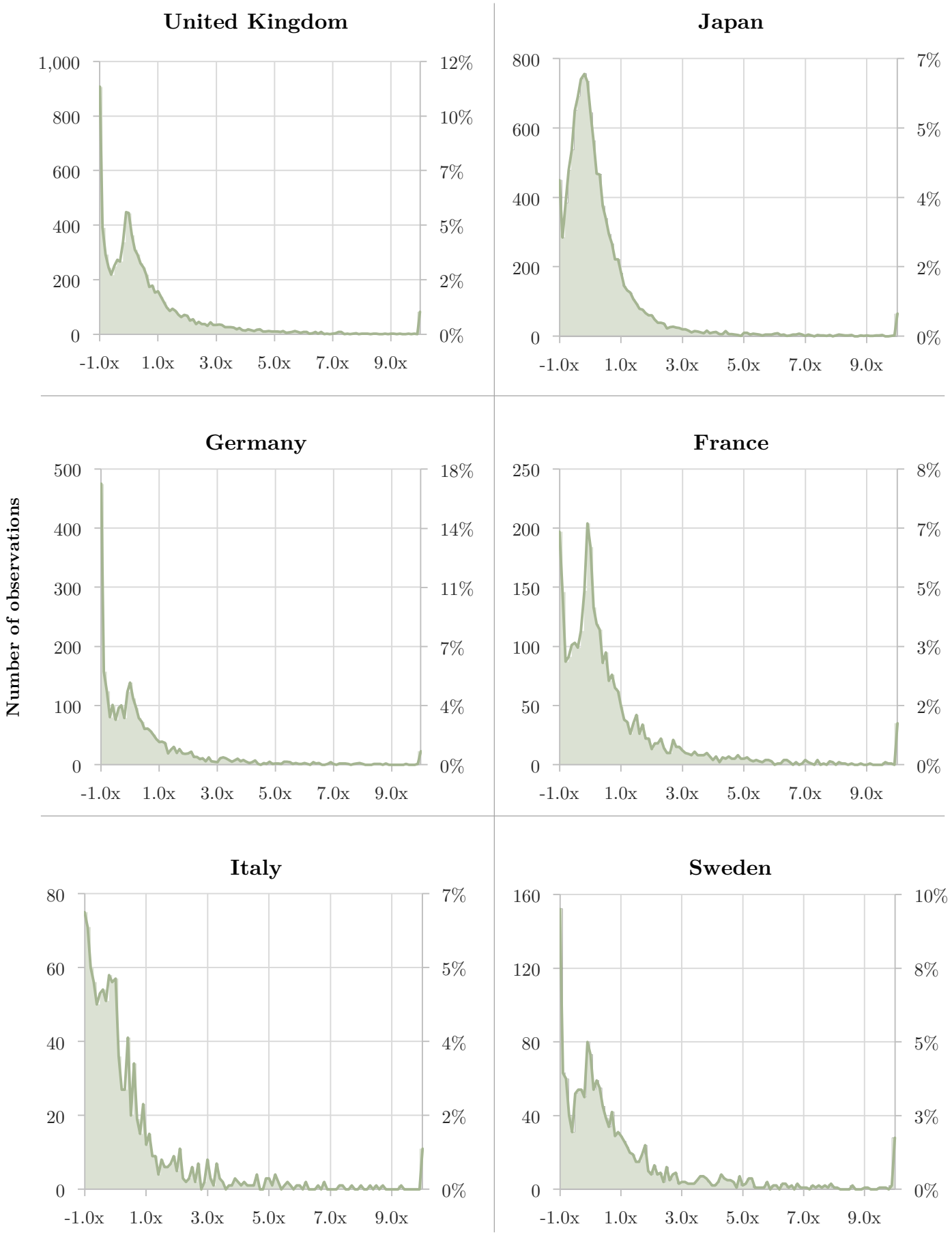
Figure C.2: Annual Frequency Distributions of Buy-and-Hold Returns



1. The figures display frequency distributions for annual buy-and-hold returns

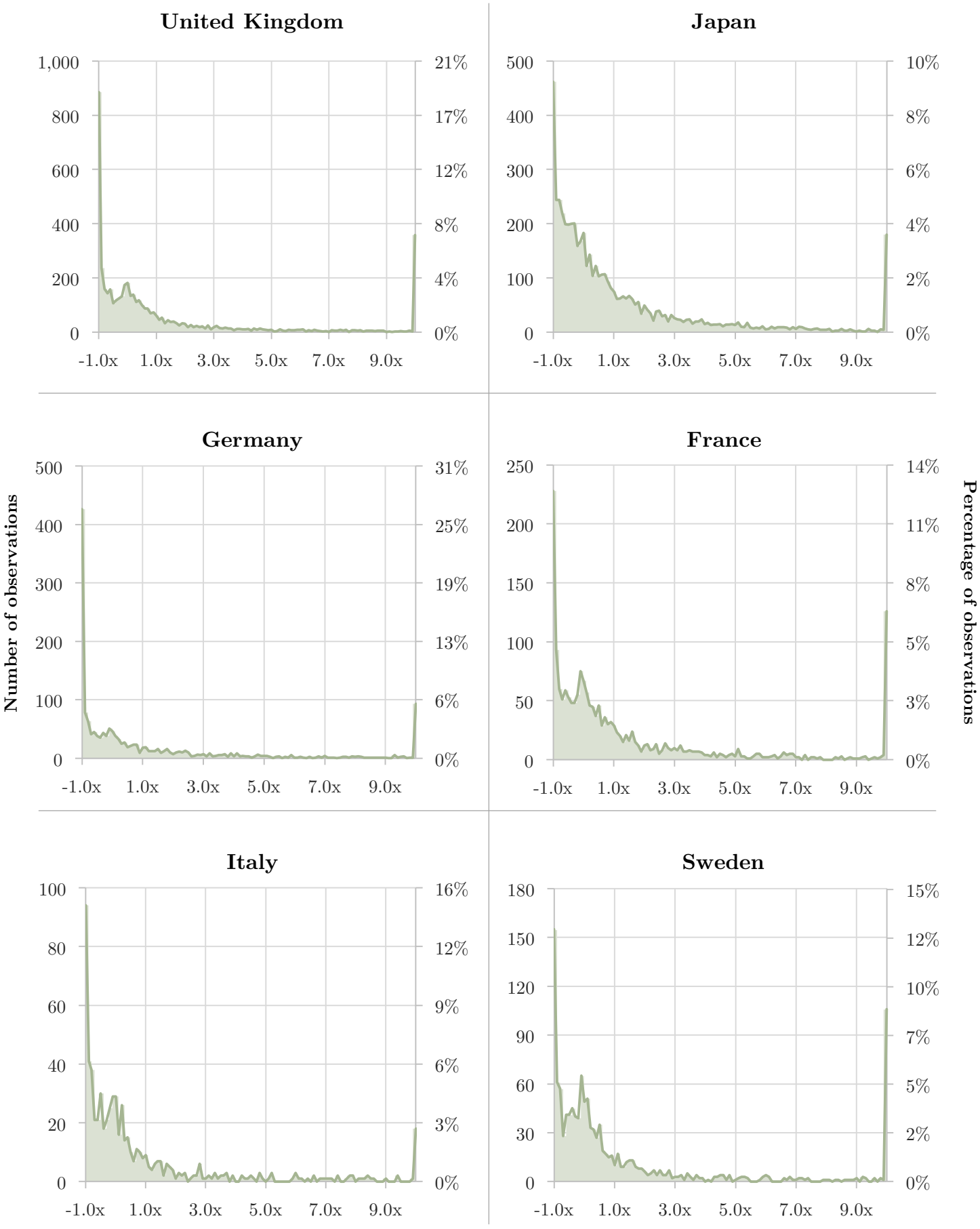
2. Returns are grouped by 5% with an overhead bin at >500%

Figure C.3: Decade Frequency Distributions of Buy-and-Hold Returns



1. *The figures display frequency distributions for decade buy-and-hold returns*
2. *Returns are grouped by 10% with an overhead bin at >1000%*

Figure C.4: Lifetime Frequency Distributions of Buy-and-Hold Returns



1. *The figures display frequency distributions for lifetime buy-and-hold returns*
2. *Returns are grouped by 10% with an overhead bin at >1000%*

D Analysis: Buy-and-Hold Returns by Size

Table D.1: Buy-and-Hold Returns by Group, Decade Horizon

Group	Mean	Median	SD	Skew	Mean	Median	SD	Skew
	United Kingdom				*Japan*			
1	-0.535	-0.847	0.913	8.612	-0.399	-0.495	0.620	3.157
2	-0.238	-0.488	0.990	4.733	-0.081	-0.229	0.715	2.644
3	0.029	-0.165	1.643	14.662	0.103	-0.123	0.998	3.942
4	0.266	0.013	1.686	9.596	0.157	-0.086	1.087	4.809
5	0.508	0.149	1.702	6.546	0.287	-0.022	1.306	4.387
6	0.835	0.328	2.893	14.450	0.509	0.068	1.797	6.706
7	1.337	0.526	4.958	17.922	0.527	0.089	1.699	5.060
8	1.557	0.781	2.627	3.964	0.773	0.316	2.037	5.881
9	1.951	1.005	3.151	3.993	1.175	0.404	4.666	12.899
10	2.070	1.384	3.041	6.859	1.474	0.581	12.398	30.697
	Germany				*France*			
1	-0.728	-0.977	0.601	4.168	-0.419	-0.646	0.720	3.327
2	-0.462	-0.806	0.760	2.704	-0.159	-0.287	0.939	5.261
3	-0.259	-0.505	0.855	1.990	0.022	-0.069	0.960	4.338
4	0.024	-0.302	2.292	11.626	0.327	0.008	1.329	2.500
5	-0.013	-0.143	0.867	2.777	0.600	0.083	2.057	5.558
6	0.381	-0.015	1.793	5.324	0.783	0.264	1.802	4.269
7	0.940	0.283	3.115	10.803	1.151	0.527	2.108	3.160
8	1.526	0.495	2.971	3.879	1.621	0.662	3.290	5.611
9	1.518	0.715	2.700	3.279	1.978	0.915	3.937	7.328
10	2.047	1.080	5.408	12.414	1.932	1.156	2.831	4.226
	Italy				*Sweden*			
1	0.008	-0.008	0.248	27.986	0.022	0.000	0.380	13.764
2	-0.494	-0.766	0.718	3.451	-0.459	-0.776	0.679	2.021
2	-0.320	-0.469	0.679	2.758	-0.189	-0.354	0.836	1.858
3	0.118	-0.221	1.743	5.691	0.111	-0.252	1.536	3.895
4	0.212	-0.112	1.201	2.157	0.280	0.005	1.203	2.634
5	0.184	-0.264	1.489	3.798	0.769	0.231	1.816	3.438
6	0.658	-0.010	2.073	2.892	1.089	0.351	2.530	3.972
7	0.794	0.311	1.569	1.819	1.743	0.699	3.295	3.919
8	1.989	0.396	6.158	6.221	2.101	0.923	3.458	2.656
9	1.269	0.651	2.325	3.387	2.511	1.220	4.079	4.924
10	1.584	0.583	3.307	5.093	3.806	2.097	8.552	8.483

1. The stocks are divided into deciles based on market capitalization. The table gives an overview of the buy and hold return with decade intervals for individual stocks on the British, Japanese, German, French, Italian and Swedish stock market.

Table D.2: BaHR by Group vs Benchmarks, Decade Horizon

Group	% > 0	% > T-Bill	% > VW	% > EW	% > 0	% > T-Bill	% > VW	% > EW
	United Kingdom				***Japan***			
1	14.1%	11.4%	7.94%	7.86%	17.6%	15.6%	10.7%	5.1%
2	27.2%	21.3%	14.9%	15.3%	32.7%	28.6%	21.5%	10.4%
3	37.6%	29.6%	20.6%	20.1%	41.5%	37.3%	30.2%	16.7%
4	50.9%	40.4%	30.5%	31.0%	42.7%	38.8%	30.8%	18.1%
5	59.7%	49.0%	36.0%	35.7%	48.4%	43.4%	38.0%	22.7%
6	68.4%	55.0%	43.0%	43.2%	55.6%	49.1%	43.2%	26.1%
7	75.6%	62.8%	49.3%	46.8%	55.6%	49.6%	45.1%	27.2%
8	81.4%	70.1%	58.8%	57.7%	66.6%	58.6%	53.5%	32.2%
9	86.3%	77.6%	63.4%	61.1%	71.1%	63.1%	58.3%	34.5%
10	91.6%	80.7%	66.8%	63.1%	77.8%	71.3%	65.4%	38.3%
	Germany				***France***			
1	7.2 %	5.4 %	5.1 %	3.8 %	21.1 %	19.0 %	16.5 %	13.2 %
2	18.8 %	13.8 %	7.7 %	7.3 %	30.5 %	26.3 %	19.6 %	13.0 %
3	27.8 %	22.5 %	16.3 %	10.1 %	40.0 %	35.5 %	27.1 %	19.7 %
4	33.5 %	29.2 %	18.2 %	15.7 %	50.9 %	43.4 %	36.3 %	29.9 %
5	42.6 %	34.5 %	26.9 %	16.9 %	56.8 %	52.7 %	39.7 %	27.4 %
6	49.0 %	41.6 %	35.4 %	18.3 %	69.3 %	56.6 %	45.5 %	27.6 %
7	67.1 %	59.3 %	46.1 %	27.5 %	73.0 %	62.9 %	52.1 %	30.6 %
8	77.2 %	66.7 %	56.5 %	37.0 %	74.6 %	66.8 %	54.1 %	32.6 %
9	83.5 %	73.9 %	63.5 %	42.6 %	84.4 %	72.4 %	60.7 %	41.9 %
10	87.5 %	79.4 %	74.0 %	46.3 %	88.3 %	79.7 %	63.9 %	36.5 %
	Italy				***Sweden***			
1	15.1 %	11.8 %	10.5 %	10.5 %	21.1 %	18.3 %	10.1 %	6.9 %
2	23.1 %	13.5 %	13.5 %	18.3 %	29.3 %	24.8 %	20.4 %	19.1 %
3	31.5 %	26.1 %	24.3 %	28.8 %	36.2 %	29.5 %	23.5 %	20.1 %
4	41.9 %	36.2 %	34.3 %	38.1 %	51.7 %	45.0 %	37.6 %	31.5 %
5	37.3 %	29.1 %	21.8 %	30.9 %	63.3 %	58.2 %	43.7 %	41.8 %
6	46.2 %	33.0 %	40.7 %	45.1 %	67.5 %	61.7 %	45.5 %	40.9 %
7	60.2 %	49.1 %	51.9 %	54.6 %	77.2 %	71.5 %	51.3 %	50.0 %
8	71.0 %	55.1 %	65.4 %	68.2 %	84.6 %	75.8 %	59.1 %	56.4 %
9	76.4 %	62.3 %	53.8 %	62.3 %	88.1 %	80.4 %	62.9 %	58.0 %
10	78.8 %	67.7 %	55.6 %	59.6 %	98.4 %	94.4 %	65.6 %	64.0 %

1.The stocks are divided into deciles based on market capitalization. The table gives an overview of the decade buy and hold return compared to different Benchmarks to see how the returns performed relatively. The table includes individual stocks on the British, Japanese, German, French, Italian and Swedish stock market.

E Analysis: Bootstrap Simulation

Table E.1: Bootstrap Simulation, Decade Horizon

	Mean	Median	SD	Skew	Mean	Median	SD	Skew
	United Kingdom				***Japan***			
1 Stock Portfolio	1.833	-0.095	29.789	152.762	0.986	-0.080	4.447	21.599
5 Stock Portfolio	1.561	0.983	2.200	2.924	0.543	0.196	1.307	3.484
25 Stock Portfolio	1.678	1.438	1.427	1.211	0.456	0.304	0.758	1.776
50 Stock Portfolio	1.652	1.492	1.226	0.764	0.414	0.317	0.597	1.431
100 Stock Portfolio	1.619	1.491	1.063	0.462	0.383	0.326	0.464	1.007
	Germany				***France***			
1 Stock Portfolio	2.146	-0.314	51.320	106.531	2.827	0.223	20.070	42.830
5 Stock Portfolio	0.892	0.415	1.920	7.290	1.852	1.071	3.025	6.266
25 Stock Portfolio	1.038	0.620	1.358	2.939	1.661	1.269	1.612	2.849
50 Stock Portfolio	0.970	0.591	1.132	2.166	1.563	1.262	1.279	2.203
100 Stock Portfolio	0.868	0.539	0.923	1.600	1.488	1.265	1.017	1.565
	Italy				***Sweden***			
1 Stock Portfolio	0.984	-0.135	5.692	30.416	3.205	0.418	24.145	166.538
5 Stock Portfolio	1.122	0.365	2.500	7.644	2.933	2.139	3.128	3.248
25 Stock Portfolio	1.123	0.509	1.537	1.836	2.813	2.580	1.692	1.540
50 Stock Portfolio	1.119	0.518	1.369	1.293	2.713	2.663	1.359	1.075
100 Stock Portfolio	1.124	0.533	1.267	0.913	2.636	2.786	1.094	0.428

1. The table presents an overview of the returns from the bootstrap simulation for the 1, 5, 25, 50 and 100 stock portfolios from all of the six stock markets. These returns are linked to decade horizon. The bootstrap simulation is repeated 20,000 times, meaning that we have 60,000 decade returns.

Table E.2: Bootstrap vs Benchmarks, Decade Horizon

	% > 0	% > T-Bill	% > VW Mkt	%>0	% > T-Bill	% > VW Mkt
	United Kingdom			***Japan***		
1 Stock Portfolio	47.5 %	31.5 %	23.2 %	47.3 %	41.3 %	37.9 %
5 Stock Portfolio	78.3 %	56.1 %	37.1 %	59.7 %	50.1 %	44.2 %
25 Stock Portfolio	92.5 %	76.1 %	47.4 %	70.6 %	57.7 %	48.8 %
50 Stock Portfolio	95.1 %	81.7 %	49.1 %	75.0 %	60.0 %	49.2 %
100 Stock Portfolio	97.6 %	87.6 %	50.4 %	79.4 %	63.1 %	49.8 %
	Germany			***France***		
1 Stock Portfolio	40.1 %	27.8 %	30.9 %	55.6 %	41.8 %	32.0 %
5 Stock Portfolio	70.2 %	46.4 %	46.3 %	84.9 %	63.5 %	44.7 %
25 Stock Portfolio	88.7 %	55.8 %	60.0 %	95.8 %	74.4 %	50.4 %
50 Stock Portfolio	91.7 %	56.5 %	61.6 %	97.7 %	77.0 %	50.3 %
100 Stock Portfolio	93.5 %	57.3 %	59.7 %	99.2 %	79.5 %	50.1 %
	Italy			***Sweden***		
1 Stock Portfolio	45.3 %	28.8 %	27.3 %	58.6 %	44.5 %	25.9 %
5 Stock Portfolio	66.6 %	42.3 %	41.6 %	93.9 %	81.2 %	42.9 %
25 Stock Portfolio	82.2 %	46.7 %	51.6 %	99.7 %	97.3 %	50.5 %
50 Stock Portfolio	84.5 %	45.7 %	55.7 %	100.0 %	99.7 %	50.6 %
100 Stock Portfolio	85.5 %	43.6 %	61.2 %	100.0 %	100.0 %	50.8 %

1. The table presents an overview of the returns from the bootstrap simulation compared to different Benchmarks to see how the returns performed relatively. This is done for the 1, 5, 25, 50 and 100 stock portfolios from all of the six stock markets. These returns are linked to decade horizon. The bootstrap simulation is repeated 20,000 times, meaning that we have 60,000 decade returns.

F Analysis: Wealth Creation

Table F.1: Summary of Wealth Creation, all Markets

	UK (MGBP)	**Japan (MYEN)**	**Germany (MEUR)**	**France (MEUR)**	**Italy (MEUR)**	**Sweden (MSEK)**
Gross total wealth created	2,810,746	453,192,274	1,640,556	2,014,901	505, 624	7,600,660
Net total wealth created	2,221,760	250,862,003	685,639	1,655,489	149,989	7,154,372
Wealth destroyed	588,986	202,330,272	954,917	359,412	355,635	446,288
Mean	497	48,420	450	948	243	7,028
Median	-6	-447	-11	1	-48	12
# of companies with positive wealth creation	1,899	2,520	636	892	218	523
# of companies with negative wealth creation	2,568	2,661	887	854	398	495
Average lifetime (years)	10 $\frac{1}{2}$	18	12 $\frac{1}{2}$	10 $\frac{1}{2}$	11 $\frac{1}{2}$	8

1. The table displays a summary of the wealth creation made in UK, Japan, Germany, France, Italy and Sweden. Net total wealth creation is equal to the gross total wealth creation made at each country minus the wealth destroyed. The numbers are in each country's currency. Hence the absolute numbers are not comparable.

Table F.2: Lifetime Wealth Creation in UK, by Company

#	Company ID	Stock ID	Company Name	Lifetime Wealth Creation (MGBP)	% of Total	Cumulative % of total	Annualized Return	Start Month	End Month	Life (Months)
1	15509	540528	HSBC HLDGS PLC	161,551	7.27 %	7.27 %	15.09 %	31.01.1989	31.12.2017	348
2	1932	287580	BRITISH AMER TOBACCO PLC	149,456	6.73 %	14.00 %	18.28 %	31.01.1986	31.12.2017	384
3	12384	B03MLX2	ROYAL DUTCH SHELL PLC	126,568	5.70 %	19.69 %	8.54 %	31.08.2005	31.12.2017	149
4	2410	798059	BP PLC	108,533	4.89 %	24.58 %	10.09 %	31.01.1986	31.12.2017	384
5	18636	237400	DIAGEO PLC	77,525	3.49 %	28.07 %	12.67 %	31.01.1986	31.12.2017	384
6	28272	989529	ASTRAZENECA PLC	73,687	3.32 %	31.39 %	12.80 %	30.06.1993	31.12.2017	295
7	19565	718875	RIO TINTO GROUP (GBR)	69,380	3.12 %	34.51 %	14.09 %	31.01.1986	31.12.2017	384
8	10845	B10RZP7	UNILEVER PLC	68,189	3.07 %	37.58 %	14.13 %	31.01.1986	31.12.2017	384
9	100472	483548	SABMILLER PLC	66,351	2.99 %	40.56 %	17.46 %	31.03.1999	31.10.2016	212
10	9655	803414	SHELL TRANSPORT AND TRADING	57,344	2.58 %	43.15 %	14.95 %	31.01.1986	31.07.2005	235
11	221858	B24CGK7	RECKITT BENCKISER GROUP PLC	54,808	2.47 %	45.61 %	13.76 %	31.01.1986	31.12.2017	384
12	220757	346168	FORD MOTOR CO LTD	54,319	2.44 %	48.06 %	37.26 %	29.02.1996	30.04.2000	51
13	14087	876289	BG GROUP PLC	52,305	2.35 %	50.41 %	13.12 %	31.01.1987	29.02.2016	350
14	15782	709954	PRUDENTIAL PLC	50,923	2.29 %	52.70 %	12.18 %	31.01.1986	31.12.2017	384
15	105595	9000828	BHP BILLITON GROUP (GBR)	47,744	2.15 %	54.85 %	14.14 %	31.08.1997	31.12.2017	245
16	5180	925288	GLAXOSMITHKLINE PLC	42,786	1.93 %	56.78 %	9.31 %	31.01.1986	31.12.2017	384
17	212773	454492	IMPERIAL BRANDS PLC	37,676	1.70 %	58.47 %	16.81 %	31.10.1996	31.12.2017	255
18	211819	BDR05C0	NATIONAL GRID	34,988	1.57 %	60.05 %	11.81 %	31.01.1996	31.12.2017	264
19	14261	135656	SMITHKLINE BEECHAM (UK) PLC	32,804	1.48 %	61.53 %	19.10 %	31.08.1989	31.12.2000	137
20	62489	661496	ORANGE PLC	27,267	1.23 %	62.75 %	86.39 %	31.05.1996	29.02.2000	46
21	15508	B1XZS82	ANGLO AMERICAN PLC	25,754	1.16 %	63.91 %	9.72 %	30.04.1992	31.12.2017	309
22	17404	673123	ASSOCIATED BRITISH FOODS PLC	23,180	1.04 %	64.95 %	12.68 %	31.01.1986	31.12.2017	384
23	109179	59585	ARM HOLDINGS PLC	22,272	1.00 %	65.96 %	23.20 %	31.05.1998	30.09.2016	221
24	100338	B2B0DG9	RELX PLC	21,080	0.95 %	66.91 %	12.87 %	31.01.1986	31.12.2017	384
25	15603	560399	LEGAL & GEN GROUP PLC	20,884	0.94 %	67.85 %	12.78 %	31.01.1986	31.12.2017	384

1. The 25 companies that have had the highest wealth creation at the British stock market. The annual returns are inclusive of reinvested dividends, and refers to stock's security with the longest lifetime.

Table F.3: Lifetime Wealth Destruction in UK, by Company

#	Company ID	Stock ID	Company Name	Lifetime Wealth Creation (MGBP)	% of Total	Cumulative % of total	Annualized Return	Start Month	End Month	Life (Months)
1	14894	BH4HKS3	VODAFONE GROUP PLC	-49,145	-2.21 %	100.00 %	14.66 %	31.12.1988	31.12.2017	349
2	15634	B7T7721	ROYAL BANK OF SCOTLAND GROUP	-38,163	-1.72 %	102.21 %	2.39 %	31.01.1986	31.12.2017	384
3	30505	3058750	HBOS PLC	-37,474	-1.69 %	103.93 %	-16.49 %	31.07.1997	31.01.2009	139
4	2411	3091357	BT GROUP PLC	-15,841	-0.71 %	105.62 %	5.05 %	31.01.1986	31.12.2017	384
5	100114	B0S5CP5	TELENT PLC	-12,126	-0.55 %	106.33 %	-17.19 %	31.01.1986	31.01.2008	265
6	16436	B5KKT96	CABLE & WIRELESS COMM PLC	-10,277	-0.46 %	106.88 %	5.10 %	31.01.1986	31.05.2016	365
7	201802	843540	DIMENSION DATA HLDGS PLC	-8,914	-0.40 %	107.34 %	-13.28 %	31.08.2000	31.12.2010	125
8	31041	654452	TELEWEST COMMUNICATIONS PLC	-8,194	-0.37 %	107.74 %	-43.44 %	31.12.1994	31.07.2004	116
9	19348	B979H67	INVENSYS PLC	-6,410	-0.29 %	108.11 %	2.06 %	31.01.1986	31.01.2014	337
10	15545	216238	AVIVA PLC	-5,776	-0.26 %	108.40 %	7.07 %	31.01.1986	31.12.2017	384
11	17453	272133	BTR PLC	-5,463	-0.25 %	108.66 %	1.81 %	31.01.1986	31.01.1999	157
12	100031	906744	MOTHERCARE PLC	-5,200	-0.23 %	108.90 %	-7.08 %	28.02.1986	31.12.2017	383
13	287618	B29BCK1	EURASIAN NATURAL RESOURCES	-5,199	-0.23 %	109.14 %	-15.25 %	31.01.2008	30.11.2013	71
14	294534	B5SXPF5	ESSAR ENERGY PLC	-4,618	-0.21 %	109.37 %	-35.48 %	30.06.2010	30.06.2014	49
15	288786	B42CTW6	NEW WORLD RESOURCES PLC	-4,410	-0.20 %	109.58 %	-68.63 %	30.06.2011	31.12.2017	79
16	214862	889782	ENERGIS PLC	-4,379	-0.20 %	109.78 %	-58.52 %	31.01.1998	31.07.2002	55
17	9343	158039	CORDIANT COMMUNICATIONS GRP	-4,368	-0.20 %	109.97 %	-33.41 %	31.01.1986	31.07.2003	211
18	232336	B0XZZ51	THUS GROUP PLC	-4,113	-0.19 %	110.17 %	-29.20 %	31.12.1999	31.10.2008	107
19	238521	844781	GRANADA MEDIA PLC	-3,765	-0.17 %	110.36 %	-60.77 %	31.08.2000	31.01.2001	6
20	17644	235471	ARCADIA GROUP PLC	-3,756	-0.17 %	110.52 %	-1.48 %	31.01.1986	31.10.2002	202
21	18860	3127489	MARKS & SPENCER GROUP PLC	-3,620	-0.16 %	110.69 %	4.72 %	31.01.1986	31.12.2017	384
22	100106	927057	COATS PLC	-3,594	-0.16 %	110.86 %	-2.25 %	31.01.1986	30.06.2003	210
23	246520	B3T6935	FRIENDS PROVIDENT GROUP PLC	-3,576	-0.16 %	111.02 %	-6.97 %	31.08.2001	31.10.2009	99
24	19662	901040	KVAERNER PLC	-3,459	-0.16 %	111.18 %	-12.17 %	31.01.1986	30.06.1996	126
25	257411	3171806	HIBU PLC	-3,180	-0.14 %	111.34 %	-51.38 %	31.08.2003	31.07.2013	120

1. The 25 companies that have had the highest wealth destruction at the British stock market. The annual returns are inclusive of reinvested dividends, and refers to stock's security with the longest lifetime.

Table F.4: Lifetime Wealth Creation in Japan, by Company

#	Company ID	Stock ID	Company Name	Lifetime Wealth Creation (MYEN)	%of Total	Cumulative % of total	Annualized Return	Start Month	End Month	Life (Months)
1	19661	6900643	TOYOTA MOTOR CORP	27,505,358	11.0 %	11.0 %	8.2 %	31.01.1986	31.12.2017	384
2	204222	6770620	SOFTBANK GROUP CORP	9,440,564	3.8 %	14.7 %	15.5 %	28.02.1995	31.12.2017	275
3	5691	6435145	HONDA MOTOR CO LTD	7,588,908	3.0 %	17.8 %	7.4 %	31.01.1986	31.12.2017	384
4	103228	6490995	KEYENCE CORP	7,365,776	2.9 %	20.7 %	12.6 %	31.01.1990	31.12.2017	336
5	223528	6474535	JAPAN TOBACCO INC	6,874,587	2.7 %	23.4 %	7.1 %	30.11.1994	31.12.2017	278
6	223911	6129277	NTT DOCOMO INC	6,723,849	2.7 %	26.1 %	4.7 %	30.11.1998	31.12.2017	230
7	2721	6172323	CANON INC	6,441,701	2.6 %	28.7 %	7.7 %	31.01.1986	31.12.2017	384
8	102450	6639550	NINTENDO CO LTD	6,438,229	2.6 %	31.2 %	10.7 %	31.01.1986	31.12.2017	384
9	100718	6870445	TAKEDA PHARMACEUTICAL CO	6,386,564	2.5 %	33.8 %	8.2 %	31.01.1986	31.12.2017	384
10	201584	6248990	KDDI CORP	6,190,941	2.5 %	36.3 %	5.6 %	31.10.1993	31.12.2017	291
11	212948	6332439	FAST RETAILING CO LTD	5,038,570	2.0 %	38.3 %	23.5 %	31.12.1996	31.12.2017	253
12	19112	6640381	DENSO CORP	4,979,411	2.0 %	40.3 %	6.7 %	31.01.1986	31.12.2017	384
13	100048	6356934	FANUC CORP	4,882,160	1.9 %	42.2 %	5.7 %	31.01.1986	31.12.2017	384
14	100697	6804585	SHIN-ETSU CHEMICAL CO LTD	4,702,581	1.9 %	44.1 %	9.3 %	31.01.1986	31.12.2017	384
15	100555	6596785	MITSUBISHI CORP	4,663,848	1.9 %	45.9 %	6.8 %	31.01.1986	31.12.2017	384
16	221821	6640682	NIDEC CORP	4,588,557	1.8 %	47.8 %	18.0 %	31.10.1993	31.12.2017	291
17	100369	6132101	BRIDGESTONE CORP	4,356,975	1.7 %	49.5 %	9.5 %	31.01.1986	31.12.2017	384
18	18715	6483809	KAO CORP	4,003,697	1.6 %	51.1 %	9.3 %	31.01.1986	31.12.2017	384
19	6494	6496584	KOMATSU LTD	3,879,568	1.5 %	52.6 %	8.4 %	31.01.1986	31.12.2017	384
20	101138	6250724	DAIKIN INDUSTRIES LTD	3,740,298	1.5 %	54.1 %	11.0 %	31.01.1986	31.12.2017	384
21	212901	6183552	CENTRAL JAPAN RAILWAY CORP	3,709,006	1.5 %	55.6 %	9.3 %	30.11.1997	31.12.2017	242
22	19113	6642860	NISSAN MOTOR CO LTD	3,502,857	1.4 %	57.0 %	4.0 %	31.01.1986	31.12.2017	384
23	19043	6597045	MITSUBISHI ELECTRIC CORP	3,392,096	1.4 %	58.4 %	6.7 %	31.01.1986	31.12.2017	384
24	100226	6610403	MURATA MANUFACTURING CO LTD	3,207,045	1.3 %	59.6 %	7.8 %	31.01.1986	31.12.2017	384
25	214509	6084848	YAHOO JAPAN CORP	3,196,142	1.3 %	60.9 %	31.9 %	31.12.1997	31.12.2017	241

1. The 25 companies that have had the highest wealth creation at the Japanese stock market. The annual returns are inclusive of reinvested dividends, and refers to stock's security with the longest lifetime.

Table F.5: Lifetime Wealth Destruction in Japan, by Company

#	Company ID	Stock ID	Company Name	Lifetime Wealth Creation (MYEN)	% of Total	Cumulative % of total	Annualized Return	Start Month	End Month	Life (Months)
1	7908	6641373	NIPPON TELEGRAPH & TELEPHONE	-23,546,062	-9.4 %	100.0 %	-0.1 %	31.03.1987	31.12.2017	370
2	10137	6563024	SUMITOMO MITSUI FINANCIAL GR	-4,980,759	-2.0 %	109.4 %	-1.8 %	31.01.1986	31.12.2017	384
3	15624	6598714	SAKURA BANK LTD	-4,522,861	-1.8 %	111.4 %	-1.7 %	31.01.1986	28.02.2001	182
4	15627	6070364	BANK TOKYO-MITSUBISHI	-4,168,089	-1.7 %	113.2 %	0.3 %	31.01.1986	28.02.2001	182
5	15550	6250241	DAI-ICHI KANGYO BANK LTD	-4,133,971	-1.6 %	114.8 %	-3.0 %	31.01.1986	31.08.2000	176
6	15736	6730936	SHINSEI BANK LTD	-3,799,764	-1.5 %	116.5 %	-9.3 %	31.03.2004	31.12.2017	166
7	100688	6895404	TOKYO ELECTRIC POWER CO HOLD	-3,711,041	-1.5 %	118.0 %	-4.2 %	31.01.1986	31.12.2017	384
8	248136	6591014	MIZUHO FINANCIAL GROUP INC	-3,648,170	-1.5 %	119.5 %	-5.8 %	31.10.2000	31.12.2017	207
9	6775	6776747	SANWA BANK LTD	-3,634,970	-1.4 %	120.9 %	-3.2 %	31.01.1986	31.03.2001	183
10	15556	6356280	FUJI BANK LTD	-3,517,025	-1.4 %	122.4 %	-2.6 %	31.01.1986	30.09.2000	177
11	7652	6640400	NEC CORP	-2,750,992	-1.1 %	123.8 %	-3.7 %	31.01.1986	31.12.2017	384
12	15601	6499367	ASAHI BANK	-2,653,027	-1.1 %	124.9 %	-11.7 %	31.01.1986	28.02.2002	194
13	320611	BYT8143	JAPAN POST HOLDINGS CO LTD	-2,276,365	-0.9 %	125.9 %	-14.2 %	31.12.2015	31.12.2017	25
14	15658	6895341	TOKAI BANK LTD	-2,183,573	-0.9 %	126.8 %	-4.2 %	31.01.1986	31.03.2001	183
15	102305	6496346	KDD CORP	-2,140,725	-0.9 %	127.7 %	-6.8 %	31.01.1986	31.08.2000	176
16	15685	6462842	INDUSTRIAL BANK OF JAPAN LTD	-2,025,702	-0.8 %	128.6 %	-0.9 %	31.01.1986	31.08.2000	176
17	252940	6335171	MITSUBISHI UFJ FINANCIAL GRP	-1,819,469	-0.7 %	129.4 %	-0.7 %	31.05.2001	31.12.2017	200
18	102373	6598446	MITSUBISHI MOTORS CORP	-1,715,694	-0.7 %	130.1 %	-8.3 %	31.01.1989	31.12.2017	348
19	15626	6597261	MITSUI TRUST & BANKING	-1,501,200	-0.6 %	130.8 %	-10.3 %	31.01.1986	29.02.2000	170
20	18957	6544933	JAPAN AIRLINES CO LTD	-1,400,905	-0.6 %	131.4 %	-23.9 %	31.01.1986	28.02.2010	290
21	15670	6985305	YAMAICHI SECURITIES CO LTD	-1,375,469	-0.5 %	131.9 %	-37.6 %	31.01.1986	31.03.1998	147
22	15669	6986085	MIZUHO TRUST & BANKING CO	-1,301,606	-0.5 %	132.5 %	-8.3 %	31.01.1986	31.08.2011	308
23	18467	6356945	FUJITSU LTD	-1,288,648	-0.5 %	133.0 %	0.3 %	31.01.1986	31.12.2017	384
24	258460	6689351	TOKYU CONSTRUCTION CO LTD	-1,287,319	-0.5 %	133.5 %	-15.5 %	30.11.2003	31.12.2017	170
25	223150	6475497	VODAFONE KK	-1,203,344	-0.5 %	134.0 %	-8.3 %	31.10.1994	31.07.2005	130

1. The 25 companies that have had the highest wealth destruction at the Japanese stock market. The annual returns are inclusive of reinvested dividends, and refers to stock's security with the longest lifetime.

Table F.6: Lifetime Wealth Creation in Germany, by Company

#	Company ID	Stock ID	Company Name	Lifetime Wealth Creation (MEUR)	% of Total	Cumulative % of total	Annualized Return	Start Month	End Month	Life (Months)
1	17436	5086577	BASF SE	112, 907	16.5 %	16.5 %	12.4 %	31.01.1986	31.12.2017	384
2	103487	4846288	SAP SE	100, 060	14.6 %	31.1 %	18.8 %	30.09.1989	31.12.2017	340
3	100080	5069211	BAYER AG	88, 601	12.9 %	44.0 %	10.0 %	31.01.1986	31.12.2017	384
4	19349	5727973	SIEMENS AG	86, 140	12.6 %	56.5 %	7.3 %	31.01.1986	31.12.2017	384
5	100181	5767504	VODAFONE AG	71, 639	10.4 %	67.0 %	20.2 %	31.01.1986	31.07.2002	199
6	100022	5756029	BAYER MOTOREN WERKE AG	58, 924	8.6 %	75.6 %	10.6 %	31.01.1986	31.12.2017	384
7	15724	5231485	ALLIANZ SE	45, 416	6.6 %	82.2 %	5.9 %	31.01.1986	31.12.2017	384
8	100609	4598589	CONTINENTAL AG	42, 951	6.3 %	88.5 %	12.7 %	31.01.1986	31.12.2017	384
9	100737	5497102	VOLKSWAGEN AG	41, 681	6.1 %	94.6 %	8.3 %	31.01.1986	31.12.2017	384
10	100590	4942904	E.ON SE	34, 426	5.0 %	99.6 %	6.2 %	31.01.1986	31.12.2017	384
11	221244	4031976	ADIDAS AG	34, 017	5.0 %	104.5 %	15.0 %	31.12.1995	31.12.2017	265
12	100037	5740817	LINDE AG	32, 941	4.8 %	109.3 %	8.7 %	31.01.1986	31.12.2017	384
13	101120	5761498	AUDI AG	31, 518	4.6 %	113.9 %	16.7 %	30.06.1993	31.12.2017	295
14	241456	4617859	DEUTSCHE POST AG	30, 376	4.4 %	118.4 %	7.1 %	31.12.2000	31.12.2017	205
15	100049	5070376	HOECHST AG	30, 036	4.4 %	122.8 %	11.7 %	31.01.1986	31.07.2005	235
16	202305	4352097	FRESENIUS SE & CO KGAA	28, 048	4.1 %	126.8 %	19.1 %	30.09.1992	31.12.2017	304
17	101942	5002465	HENKEL AG & CO KGAA	25, 571	3.7 %	130.6 %	12.9 %	31.08.1996	31.12.2017	257
18	100083	5107401	BEIERSDORF AG	25, 536	3.7 %	134.3 %	11.8 %	31.01.1986	31.12.2017	384
19	15677	5294121	MUNICH RE CO	22, 475	3.3 %	137.6 %	6.2 %	31.01.1986	31.12.2017	384
20	243774	7021963	DEUTSCHE BOERSE AG	21, 695	3.2 %	140.7 %	13.3 %	31.03.2001	31.12.2017	202
21	101076	4845757	BAYER SCHERING PHARMA AG	20, 373	3.0 %	143.7 %	13.2 %	31.01.1986	30.09.2008	273
22	212782	5129074	FRESENIUS MEDICAL CARE AG&CO	19, 254	2.8 %	146.5 %	7.9 %	30.11.1996	31.12.2017	254
23	100042	5563520	MAN SE	15, 449	2.3 %	148.8 %	9.8 %	31.01.1986	31.12.2017	384
24	204825	4511809	HANNOVER RUECK SE	13, 458	2.0 %	150.7 %	14.7 %	31.03.1995	31.12.2017	274
25	15577	5801628	DRESDNER BANK AG	12, 471	1.8 %	152.6 %	8.7 %	31.01.1986	31.07.2002	199

1. The 25 companies that have had the highest wealth creation at the German stock market. The annual returns are inclusive of reinvested dividends, and refers to stock's security with the longest lifetime.

Table F.7: Lifetime Wealth Destruction in Germany, by Company

#	Company ID	Stock ID	Company Name	Lifetime Wealth Creation (MEUR)	% of Total	Cumulative % of total	Annualized Return	Start Month	End Month	Life (Months)
1	103350	4421458	KENNAMETAL HERTEL AG	-273,635	-39.9 %	100.0 %	-5.4 %	31.05.1990	30.04.2005	180
2	15537	4325419	BAYERISCHE HYPO- & VEREINSBK	-218,209	-31.8 %	139.9 %	6.0 %	31.01.1986	30.09.2008	273
3	236260	5932722	T-ONLINE INTERNATIONAL AG	-49,984	-7.3 %	171.7 %	-24.8 %	31.05.2000	31.07.2006	75
4	15576	5750355	DEUTSCHE BANK AG	-33,210	-4.8 %	179.0 %	-0.3 %	31.01.1986	31.12.2017	384
5	289999	BPVLPZ6	EPG ENGINEERED NANOPRODUCTS	-26,918	-3.9 %	183.9 %	-54.3 %	30.11.2008	30.09.2015	83
6	132740	5889505	INFINEON TECHNOLOGIES AG	-25,186	-3.7 %	187.8 %	-3.7 %	30.04.2000	31.12.2017	213
7	15575	B90LKT4	COMMERZBANK	-20,832	-3.0 %	191.5 %	-4.5 %	31.01.1986	31.12.2017	384
8	15725	4020468	ALLIANZ LEBENSVERSICHERUNGS	-19,339	-2.8 %	194.5 %	0.6 %	31.01.1986	31.12.2008	276
9	221616	5842359	DEUTSCHE TELEKOM	-14,268	-2.1 %	197.3 %	3.5 %	31.12.1996	31.12.2017	253
10	15681	5377947	ERGO VERSICHERUNGSGRUPPE AG	-12,744	-1.9 %	199.4 %	-2.4 %	31.03.1998	31.07.2010	149
11	100479	5786565	ARCANDOR AG	-5,245	-0.8 %	201.3 %	-17.9 %	31.01.1986	31.12.2017	384
12	156637	7681248	HYPO REAL ESTATE	-4,763	-0.7 %	202.0 %	-31.4 %	30.11.2003	31.10.2009	72
13	229596	5666344	CONSORS DISCOUNT BROKER AG	-4,309	-0.6 %	202.7 %	-42.5 %	31.05.1999	31.12.2002	44
14	124996	5785993	EPCOS AG	-4,046	-0.6 %	203.4 %	-9.9 %	31.12.1999	31.10.2009	119
15	237656	5975266	COMDIRECT BANK AG	-3,658	-0.5 %	203.9 %	-1.9 %	31.07.2000	31.12.2017	210
16	216059	5352353	EM TV & MERCHANDISING AG	-3,584	-0.5 %	204.5 %	-10.6 %	31.03.1998	30.04.2004	74
17	318452	BR17150	ROCKET INTERNET SE	-3,569	-0.5 %	205.0 %	-19.8 %	30.11.2014	31.12.2017	38
18	100268	4346302	FORD-WERKE AG	-3,558	-0.5 %	205.5 %	1.3 %	30.04.1989	30.06.2002	159
19	214759	5367227	HEIDELBERGER DRUCKMASCHINEN	-3,491	-0.5 %	206.0 %	-9.2 %	31.01.1998	31.12.2017	240
20	205019	5720273	MLP SE	-3,035	-0.4 %	206.5 %	6.2 %	31.08.1990	31.12.2017	329
21	235720	5898932	BIODATA INFORMATION TECH AG	-2,963	-0.4 %	207.0 %	-55.3 %	30.04.2000	30.04.2012	145
22	27832	4578127	MERCEDES AKTIENGESELLSCHAFT	-2,928	-0.4 %	207.4 %	1.7 %	31.01.1986	31.05.1994	101
23	30544	5107854	LANDESBANK BERLIN HOLDING AG	-2,893	-0.4 %	207.9 %	-1.2 %	31.01.1993	31.08.2012	236
24	100411	4434100	PHILIPP HOLZMANN AG	-2,824	-0.4 %	208.3 %	-23.7 %	31.01.1986	31.12.2017	384
25	232622	5811928	DAB BANK AG	-2,802	-0.4 %	208.7 %	-4.3 %	31.12.1999	31.07.2015	188

1. The 25 companies that have had the highest wealth destruction at the German stock market. The annual returns are inclusive of reinvested dividends, and refers to stock's security with the longest lifetime.

Table F.8: Lifetime Wealth Creation in France, by Company

#	Company ID	Stock ID	Company Name	Lifetime Wealth Creation (MEUR)	% of Total	Cumulative % of total	Annualized Return	Start Month	End Month	Life (Months)
1	14447	4061412	LVMH MOET HENNESSY LOUIS V	135, 435	8.2 %	8.2 %	13.5 %	31.01.1986	31.12.2017	384
2	24625	B15C557	TOTAL SA	129, 464	7.8 %	16.0 %	12.9 %	31.01.1986	31.12.2017	384
3	100581	4057808	L'OREAL SA	125, 139	7.6 %	23.6 %	14.7 %	31.01.1986	31.12.2017	384
4	19364	4824080	ELF AQUITAINE SA	93, 125	5.6 %	29.2 %	15.7 %	31.01.1986	30.04.2010	292
5	101204	5671735	SANOFI	76, 474	4.6 %	33.8 %	10.9 %	31.01.1986	31.12.2017	384
6	201260	4061393	CHRISTIAN DIOR SE	60, 353	3.6 %	37.5 %	15.6 %	31.01.1992	31.12.2017	312
7	15532	7309681	BNP PARIBAS	57, 256	3.5 %	40.9 %	7.6 %	30.11.1993	31.12.2017	290
8	222379	5505072	KERING	50, 998	3.1 %	44.0 %	14.5 %	31.01.1986	31.12.2017	384
9	203053	5253973	HERMES INTERNATIONAL	50, 089	3.0 %	47.0 %	19.5 %	31.01.1994	31.12.2017	288
10	17452	B1Y9TB3	DANONE	47, 490	2.9 %	49.9 %	11.1 %	31.01.1986	31.12.2017	384
11	102296	B1XH026	VINCI SA	46, 781	2.8 %	52.7 %	11.4 %	31.05.1989	31.12.2017	344
12	101202	B1YXBJ7	L'AIR LIQUIDE SA	42, 408	2.6 %	55.3 %	10.1 %	31.01.1986	31.12.2017	384
13	101336	4834108	SCHNEIDER ELECTRIC SA	34, 387	2.1 %	57.3 %	5.6 %	31.01.1986	31.12.2017	384
14	101396	4682329	PERNOD RICARD SA	33, 709	2.0 %	59.4 %	12.6 %	31.01.1986	31.12.2017	384
15	63120	7088429	AXA SA	33, 514	2.0 %	61.4 %	6.7 %	31.01.1986	31.12.2017	384
16	101305	B058TZ6	SAFRAN SA	33, 230	2.0 %	63.4 %	14.6 %	31.01.1986	31.12.2017	384
17	13467	4736817	AVENTIS SA	24, 726	1.5 %	64.9 %	13.2 %	28.02.1993	30.09.2005	152
18	101248	7212477	ESSILOR INTERNATIONAL SA	24, 398	1.5 %	66.4 %	13.1 %	31.01.1986	31.12.2017	384
19	102647	5718988	SOCIETE D EDITION DE CANAL P	22, 078	1.3 %	67.7 %	13.3 %	31.07.1990	30.09.2015	303
20	210479	4712798	RENAULT SA	20, 358	1.2 %	68.9 %	7.3 %	31.12.1994	31.12.2017	277
21	63169	5330047	DASSAULT SYSTEMS SA	20, 341	1.2 %	70.2 %	13.5 %	31.08.1996	31.12.2017	257
22	15784	5966516	SOCIETE GENERALE GROUP	20, 176	1.2 %	71.4 %	6.6 %	31.08.1987	31.12.2017	365
23	101285	4706672	PROMODES SA	18, 314	1.1 %	72.5 %	32.7 %	31.01.1986	30.09.2000	177
24	102089	7062713	SODEXO	17, 950	1.1 %	73.6 %	14.4 %	31.01.1986	31.12.2017	384
25	101811	7380482	SAINT-GOBAIN (CIE DE)	17, 909	1.1 %	74.7 %	7.3 %	31.01.1987	31.12.2017	372

1. The 25 companies that have had the highest wealth creation at the French stock market. The annual returns are inclusive of reinvested dividends, and refers to stock's security with the longest lifetime.

Table F.9: Lifetime Wealth Destruction in France, by Company

#	Company ID	Stock ID	Company Name	Lifetime Wealth Creation (MEUR)	% of Total	Cumulative % of total	Annualized Return	Start Month	End Month	Life (Months)
1	101352	5975006	ALCATEL-LUCENT	-49,370	-3.0 %	100.0 %	-2.8 %	31.07.1987	31.10.2016	352
2	101264	4834777	VIVENDI SA	-30,495	-1.8 %	103.0 %	6.4 %	31.01.1986	31.12.2017	384
3	220940	5176177	ORANGE	-22,654	-1.4 %	104.8 %	1.5 %	30.11.1997	31.12.2017	242
4	220942	B0C2CQ3	ENGIE SA	-19,802	-1.2 %	106.2 %	0.4 %	31.08.2005	31.12.2017	149
5	220920	B0NJJ17	EDF	-16,778	-1.0 %	107.4 %	-3.4 %	31.12.2005	31.12.2017	145
6	238599	4066611	ORANGE LTD	-14,342	-0.9 %	108.4 %	-17.5 %	31.08.2000	31.07.2004	48
7	220867	B5229L2	AREVA SA	-9,796	-0.6 %	109.3 %	-26.1 %	30.06.2011	31.08.2017	75
8	125863	B4MMD80	TECHNICOLOR SA	-8,756	-0.5 %	109.9 %	-19.5 %	31.12.1999	31.12.2017	217
9	102758	B29QD14	EURO DISNEY SCA	-6,973	-0.4 %	110.4 %	-13.7 %	31.12.1989	30.06.2017	331
10	100346	5641567	CARREFOUR SA	-6,934	-0.4 %	110.8 %	7.6 %	31.01.1986	31.12.2017	384
11	15589	4214410	PARIBAS SA	-6,750	-0.4 %	111.2 %	5.9 %	31.03.1987	31.05.1998	135
12	23915	9700710	UNION DES ASSUR PARIS	-6,538	-0.4 %	111.6 %	-4.6 %	31.07.1990	31.01.1997	79
13	214321	B2830B5	LEON DE BRUXELLES	-5,929	-0.4 %	112.0 %	-32.6 %	31.10.1997	30.06.2009	141
14	235539	5922433	LIBERTY SURF GROUP SA	-5,926	-0.4 %	112.4 %	-42.5 %	30.04.2000	30.09.2005	66
15	238244	5996126	NRJ GROUP	-4,895	-0.3 %	112.7 %	-8.0 %	31.07.2000	31.12.2017	210
16	211399	B2PW3T4	ATARI	-4,755	-0.3 %	113.0 %	-33.7 %	30.11.1995	31.12.2017	266
17	102983	BYVFMG1	CGG	-4,428	-0.3 %	113.3 %	-11.4 %	31.01.1986	31.12.2017	384
18	112040	B1Y9JH9	RHODIA	-4,337	-0.3 %	113.6 %	-11.1 %	31.07.1998	30.09.2011	159
19	101475	4916039	AIR FRANCE - KLM	-4,109	-0.2 %	113.9 %	-4.8 %	31.03.1989	31.12.2017	346
20	101406	B0V2C19	BULL SA	-3,836	-0.2 %	114.1 %	-10.5 %	31.03.1998	31.12.2014	202
21	30688	5876507	BUSINESS OBJECTS SA	-3,829	-0.2 %	114.3 %	-8.5 %	31.01.2000	29.02.2008	98
22	238616	4031879	VEOLIA ENVIRONNEMENT	-3,485	-0.2 %	114.6 %	1.2 %	31.08.2000	31.12.2017	209
23	101944	4163437	CAPGEMINI SE	-3,462	-0.2 %	114.8 %	5.1 %	30.06.1988	31.12.2017	355
24	218399	B0DJ8Q5	ALSTOM SA	-3,406	-0.2 %	115.0 %	-9.1 %	31.07.1998	31.12.2017	234
25	104924	4676872	PECHINEY INTERNATIONAL	-3,065	-0.2 %	115.2 %	-5.7 %	31.05.1989	28.02.1999	118

1. The 25 companies that have had the highest wealth destruction at the French stock market. The annual returns are inclusive of reinvested dividends, and refers to stock's security with the longest lifetime.

Table F.10: Lifetime Wealth Creation in Italy, by Company

#	Company ID	Stock ID	Company Name	Lifetime Wealth Creation (MEUR)	% of Total	Cumulative % of total	Annualized Return	Start Month	End Month	Life (Months)
1	61616	7145056	ENI SPA	97, 513	65.0 %	65.0 %	9.6 %	31.12.1995	31.12.2017	265
2	19540	5297506	TELECOM ITALIA SPA	36, 355	24.2 %	89.3 %	23.7 %	29.02.1988	31.08.2003	187
3	102743	7667163	ATLANTIA SPA	32, 997	22.0 %	111.3 %	19.8 %	30.11.1990	31.12.2017	326
4	214259	4876746	TIM-TELECOM ITALIA MOBILE	22, 028	14.7 %	125.9 %	19.1 %	31.08.1995	30.06.2005	119
5	101090	4811565	TELECOM ITALIA SPA-OLD	19, 421	12.9 %	138.9 %	26.0 %	31.01.1986	31.07.1997	139
6	249457	7251470	SNAM SPA	18, 634	12.4 %	151.3 %	12.1 %	31.01.2002	31.12.2017	192
7	20196	4800659	LUXOTTICA GROUP SPA	17, 678	11.8 %	163.1 %	8.5 %	30.04.2001	31.12.2017	201
8	201794	7144569	ENEL SPA	13, 140	8.8 %	171.9 %	4.1 %	31.12.1999	31.12.2017	217
9	24589	5556575	SAN PAOLO-IMI SPA	11, 298	7.5 %	179.4 %	9.7 %	31.05.1992	31.12.2006	176
10	270451	B01BN57	TERNA SPA	10, 438	7.0 %	186.3 %	14.1 %	31.08.2004	31.12.2017	161
11	16331	BYSLCX9	EXOR SPA	10, 129	6.8 %	193.1 %	29.0 %	31.03.2009	31.12.2017	106
12	15786	4718246	RAS HOLDINGS SPA	8, 437	5.6 %	198.7 %	8.9 %	31.01.1986	31.10.2006	250
13	102429	B07DRZ5	RECORDATI SPA	8, 153	5.4 %	204.2 %	18.2 %	31.08.1990	31.12.2017	329
14	246939	BZ4CMZ5	DAVIDE CAMPARI SPA	6, 961	4.6 %	208.8 %	15.8 %	30.09.2001	31.12.2017	196
15	30543	4235778	ROLO BANCA 1473 SPA	6, 925	4.6 %	213.4 %	21.9 %	30.11.1993	30.06.2002	104
16	201535	5256206	AUTOGRILL SPA	6, 376	4.3 %	217.7 %	17.4 %	29.02.1996	31.12.2017	263
17	212955	BYWP840	BANCA MEDIOLANUM	6, 158	4.1 %	221.8 %	10.7 %	31.07.1996	31.12.2017	258
18	15516	4072942	BANCA COMMERCIALE ITALIANA	5, 604	3.7 %	225.5 %	13.7 %	31.01.1986	30.04.2001	184
19	16170	4072328	RETI BANCARIE HOLDING SPA	4, 896	3.3 %	228.8 %	26.4 %	31.08.1990	31.10.2006	195
20	16397	4079631	BANCA FIDEURAM SPA	4, 766	3.2 %	232.0 %	15.0 %	31.08.1990	31.01.2007	198
21	30431	4534936	INA-ISTITUTO NAZ ASSICURAZ	4, 566	3.0 %	235.0 %	12.9 %	31.08.1994	30.11.2001	88
22	240716	B1TJQH3	BANCA CR FIRENZE	4, 285	2.9 %	237.9 %	24.2 %	31.08.2000	30.04.2008	93
23	212266	BF37983	BREMBO SPA	4, 094	2.7 %	240.6 %	14.8 %	31.01.1996	31.12.2017	264
24	25885	7154609	CAPITALIA SPA	3, 889	2.6 %	243.2 %	2.3 %	30.09.1991	30.09.2007	193
25	247732	7169517	DE LONGHI SPA	3, 847	2.6 %	245.7 %	17.3 %	31.10.2001	31.12.2017	195

1. The 25 companies that have had the highest wealth creation at the Italian stock market. The annual returns are inclusive of reinvested dividends, and refers to stock's security with the longest lifetime.

Table F.11: Lifetime Wealth Destruction in Italy, by Company

#	Company ID	Stock ID	Company Name	Lifetime Wealth Creation (MEUR)	% of Total	Cumulative % of total	Annualized Return	Start Month	End Month	Life (Months)
1	15549	BYMXPS7	UNICREDIT SPA	-48,120	-32.1 %	100.0 %	1.3 %	31.01.1986	31.12.2017	384
2	19151	7634394	TELECOM ITALIA SPA	-34,420	-22.9 %	132.1 %	-5.2 %	31.01.1986	31.12.2017	384
3	24584	BDJ0CR2	BANCA MONTE DEI PASCHI SIENA	-25,816	-17.2 %	155.0 %	-31.5 %	31.07.1999	31.12.2017	222
4	235800	5935356	FASTWEB	-17,008	-11.3 %	172.2 %	-20.0 %	30.04.2000	31.03.2011	132
5	104652	7513578	EDISON SPA	-13,929	-9.3 %	183.6 %	-16.1 %	31.07.1989	30.09.2012	279
6	225081	BYMD5K9	BANCO BPM SPA	-12,835	-8.6 %	192.9 %	-13.2 %	31.12.1998	31.12.2017	229
7	16267	B0DJNG0	LEONARDO SPA	-8,465	-5.6 %	201.4 %	-2.4 %	31.08.1990	31.12.2017	329
8	100936	B0L4LJ6	ALITALIA SPA	-8,291	-5.5 %	207.1 %	-15.5 %	30.04.1987	30.06.2008	255
9	270266	7622225	UNIONE DI BANCHE ITALIANE	-7,250	-4.8 %	212.6 %	-5.2 %	31.08.2003	31.12.2017	173
10	232256	5953529	TISCALI SPA	-6,953	-4.6 %	217.4 %	-22.2 %	30.11.1999	31.12.2017	218
11	101174	4457594	SNIA SPA	-5,109	-3.4 %	222.1 %	-13.0 %	31.01.1986	30.04.2010	292
12	23586	4162371	CIR-COMPAGNIE INDUSTR	-4,934	-3.3 %	225.5 %	0.0 %	31.01.1986	31.12.2017	384
13	15804	4056719	ASSICURAZIONI GENERALI SPA	-4,913	-3.3 %	228.8 %	5.0 %	31.01.1986	31.12.2017	384
14	216660	BXRTMD7	BANCA CARIGE SPA GEN & IMPER	-4,854	-3.2 %	232.0 %	-21.7 %	30.04.1998	31.12.2017	237
15	15826	4344771	LA FONDIARIA ASSICURAZIONI	-4,829	-3.2 %	235.3 %	-4.1 %	31.01.1986	31.12.2002	204
16	235722	5932012	DEA CAPITAL SPA	-4,768	-3.2 %	238.5 %	-14.8 %	30.04.2000	31.12.2017	213
17	16348	4076836	INTESA SANPAOLO SPA	-4,527	-3.0 %	241.7 %	7.2 %	31.01.1986	31.12.2017	384
18	24301	5733130	IFIL INVESTMENTS SPA	-3,795	-2.5 %	244.7 %	-6.4 %	31.08.1990	28.02.2009	223
19	102346	4689900	PIRELLI SPA	-3,756	-2.5 %	247.2 %	-0.9 %	31.01.1986	31.08.2003	212
20	13436	5676127	MONTEDISON SPA - OLD	-3,386	-2.3 %	249.7 %	2.7 %	31.01.1986	30.11.2000	179
21	200640	B00KJ13	FINECOGROUP SPA	-3,014	-2.0 %	252.0 %	9.7 %	31.08.1990	31.12.2005	185
22	24564	4072168	BANCA POPOLARE DI MILANO	-2,948	-2.0 %	254.0 %	-3.0 %	31.08.1990	31.12.2016	317
23	16313	4085177	GEMINA	-2,853	-1.9 %	256.0 %	4.4 %	31.01.1986	30.11.2013	335
24	15406	7128563	BENETTON GROUP SPA	-2,836	-1.9 %	257.9 %	1.2 %	31.08.1986	31.05.2012	310
25	277971	B04F679	SARAS RAFFINERIE SARDE SPA	-2,814	-1.9 %	259.8 %	-5.2 %	30.06.2006	31.12.2017	139

1. The 25 companies that have had the highest wealth destruction at the Italian stock market. The annual returns are inclusive of reinvested dividends, and refers to stock's security with the longest lifetime.

Table F.12: Lifetime Wealth Creation in Sweden, by Company

#	Company ID	Stock ID	Company Name	Lifetime Wealth Creation (MSEK)	% of Total	Cumulative % of total	Annualized Return	Start Month	End Month	Life (Months)
1	17420	BD97BN2	ATLAS COPCO AB	561, 782	7.9 %	7.9 %	18.7 %	31.01.1986	31.12.2017	384
2	11217	B1QH7Y4	VOLVO AB	447, 649	6.3 %	14.1 %	13.3 %	31.01.1986	31.12.2017	384
3	214881	5380031	NORDEA BANK AB	422, 049	5.9 %	20.0 %	9.8 %	31.01.1998	31.12.2017	240
4	102276	5687431	HENNES & MAURITZ AB	410, 870	5.7 %	25.8 %	19.5 %	31.01.1986	31.12.2017	384
5	15699	5679579	INVESTOR AB	332, 189	4.6 %	30.4 %	13.7 %	30.11.1991	31.12.2017	314
6	15654	BXDZ9Q1	SVENSKA HANDELSBANKEN	326, 300	4.6 %	35.0 %	15.2 %	31.01.1986	31.12.2017	384
7	30938	5241503	ASTRA AB	263, 617	3.7 %	38.6 %	28.1 %	31.01.1986	30.04.1999	160
8	24578	4846523	SWEDBANK AB	257, 250	3.6 %	42.2 %	13.5 %	31.07.1995	31.12.2017	270
9	12368	B1VVGZ5	SCA-SVENSKA CELLULOSA AB	242, 013	3.4 %	45.6 %	13.5 %	31.01.1986	31.12.2017	384
10	15671	4813345	SKANDINAVISKA ENSKILDA BANK	238, 364	3.3 %	49.0 %	11.0 %	31.01.1986	31.12.2017	384
11	19591	B1VQ252	SANDVIK AB	222, 110	3.1 %	52.1 %	14.5 %	30.04.1988	31.12.2017	357
12	62557	B1RDTD4	SCANIA AB	179, 351	2.5 %	54.6 %	13.3 %	31.05.1996	30.06.2014	218
13	223492	BYPC1T4	ASSA ABLOY AB	173, 572	2.4 %	57.0 %	24.0 %	31.12.1994	31.12.2017	277
14	4439	5957480	TELEFONAKTIEBOLAGET LM ERICS	159, 472	2.2 %	59.2 %	8.1 %	31.01.1986	31.12.2017	384
15	14620	B1KKBV4	ELECTROLUX AB	134, 272	1.9 %	61.1 %	11.2 %	31.01.1986	31.12.2017	384
16	103065	B1XFTL2	HEXAGON AB	134, 015	1.9 %	63.0 %	23.5 %	30.11.1991	31.12.2017	314
17	100956	5048566	SWEDISH MATCH AB	109, 573	1.5 %	64.5 %	17.0 %	30.06.1996	31.12.2017	259
18	11749	B1Q3HT7	SKF AB	108, 945	1.5 %	66.0 %	11.8 %	31.01.1986	31.12.2017	384
19	100980	7142091	SKANSKA AB	102, 892	1.4 %	67.5 %	9.7 %	31.01.1988	31.12.2017	360
20	103036	B1VSK10	INDUSTRIVARDEN AB	98, 088	1.4 %	68.8 %	13.1 %	31.01.1986	31.12.2017	384
21	251921	7332687	ALFA LAVAL AB	88, 338	1.2 %	70.1 %	17.7 %	31.07.2002	31.12.2017	186
22	64894	BDFD9D0	BOLIDEN AB	80, 075	1.1 %	71.2 %	5.2 %	30.04.2000	31.12.2017	213
23	228316	BD6S7D0	INVESTMENTS AB KINNEVIK	75, 006	1.0 %	72.2 %	11.7 %	30.06.1999	31.12.2017	223
24	16299	BZ404X1	LATOUR INVESTMENT AB	70, 115	1.0 %	73.2 %	20.3 %	30.11.1991	31.12.2017	314
25	248420	7187627	LUNDIN PETROLEUM AB	61, 085	0.9 %	74.1 %	28.7 %	30.11.2001	31.12.2017	194

1. The 25 companies that have had the highest wealth creation at the Swedish stock market. The annual returns are inclusive of reinvested dividends, and refers to stock's security with the longest lifetime.

Table F.13: Lifetime Wealth Destruction in Sweden, by Company

#	Company ID	Stock ID	Company Name	Lifetime Wealth Creation (MSEK)	% of Total	Cumulative % of total	Annualized Return	Start Month	End Month	Life (Months)
1	220579	5978384	TELIA COMPANY AB	-30,926	-0.4 %	100.0 %	0.4 %	31.07.2000	31.12.2017	210
2	220575	7129577	SAS AB	-28,492	-0.4 %	100.4 %	-13.1 %	31.08.2001	31.12.2017	197
3	132987	7449145	SONG NETWORKS HLDG AB	-26,027	-0.4 %	100.8 %	-63.0 %	30.04.2000	31.01.2005	58
4	241562	BD24YQ4	ENIRO AB	-25,350	-0.4 %	101.2 %	-38.5 %	31.12.2000	31.12.2017	205
5	235558	5981423	ARBONA AB	-10,645	-0.1 %	101.5 %	-35.4 %	30.04.2000	31.12.2017	213
6	212102	5054518	FERMENTA AB	-10,044	-0.1 %	101.7 %	-50.8 %	31.01.1986	30.11.1993	95
7	239281	BYXH7R1	ANOTO GROUP AB	-9,965	-0.1 %	101.8 %	-29.5 %	30.09.2000	31.12.2017	208
8	215390	BYPBRY8	ENEA AB	-9,635	-0.1 %	102.0 %	6.2 %	28.02.1998	31.12.2017	239
9	239637	5883552	UTFORS AB	-8,712	-0.1 %	102.1 %	-76.5 %	30.09.2000	31.03.2004	43
10	234209	5951266	TELELOGIC AB	-7,784	-0.1 %	102.2 %	-13.0 %	29.02.2000	30.04.2008	99
11	252008	B93LF74	PA RESOURCES AB	-7,533	-0.1 %	102.3 %	-56.0 %	30.09.2004	31.01.2016	137
12	234224	7183227	CISION AB	-7,084	-0.1 %	102.4 %	-13.7 %	29.02.2000	31.08.2014	175
13	238116	5982330	SCANDINAVIA ONLINE AB	-5,678	-0.1 %	102.5 %	-78.6 %	31.07.2000	31.01.2002	19
14	213048	4668028	PRICER AB	-5,259	-0.1 %	102.6 %	-15.9 %	31.01.1997	31.12.2017	252
15	230389	B01FWW9	LB ICON AB	-4,608	-0.1 %	102.7 %	-22.7 %	28.02.1999	31.07.2006	90
16	213484	7567713	MANDATOR AB	-4,591	-0.1 %	102.8 %	-23.1 %	30.04.1997	31.12.2007	129
17	100341	5667927	TELIGENT AB	-4,569	-0.1 %	102.8 %	-56.5 %	29.02.2000	31.10.2008	105
18	216632	5578290	TELECA AB	-4,459	-0.1 %	102.9 %	-17.1 %	30.04.1998	31.03.2009	132
19	285152	B1Z2K74	ENERGYO SOLUTIONS RUSSIA AB	-4,437	-0.1 %	103.0 %	-17.5 %	31.07.2007	31.12.2017	126
20	234250	5967683	NET INSIGHT AB	-4,266	-0.1 %	103.0 %	-14.0 %	29.02.2000	31.12.2017	215
21	281652	B1HDN54	RADISSON HOSPITALITY AB	-4,203	-0.1 %	103.1 %	-4.8 %	31.12.2006	31.12.2017	133
22	216628	5262021	PROSOLVIA AB	-4,119	-0.1 %	103.1 %	-100.0 %	30.04.1998	31.01.1999	10
23	213323	7743320	ACTIVE BIOTECH AB	-4,109	-0.1 %	103.2 %	-14.9 %	28.02.1997	31.12.2017	251
24	234157	B0DVBH3	A-COM AB	-4,013	-0.1 %	103.2 %	-58.0 %	29.02.2000	31.01.2013	156
25	238163	5981939	AU-SYSTEM AB	-3,775	-0.1 %	103.3 %	-62.6 %	31.07.2000	28.02.2002	20

1. The 25 companies that have had the highest wealth destruction at the Swedish stock market. The annual returns are inclusive of reinvested dividends, and refers to stock's security with the longest lifetime.