Foreign Market Portfolio Concentration and Performance

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Using security holdings of 49,857 foreign investors on the Oslo Stock Exchange (OSE), I test whether concentrated investment strategies in international markets result in excess risk-adjusted returns. I find that investors with higher learning capacity increase returns, while investors with lower learning capacity decrease returns from the portfolio concentration. I measure learning capacity as institutional classification, geographical proximity to Norway, and cultural closeness to Norwegian investors (as based on the Hofstede cultural closeness measures). I conclude, consistent with the information advantage theory, that concentrated investment strategies in foreign markets can be optimal (disastrous) for investors with higher (lower) learning capacity.

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I. Introduction

Traditional asset pricing theory suggests that holding the market portfolio through international diversification optimizes risk-return characteristics (Markowitz, 1952). In practice, we find that investors concentrate portfolios in a small number of securities thereby missing out on obvious diversification benefits. More recent theoretical research explains this apparent discrepancy using investor learning. When investors obtain information before they invest, portfolio holdings are concentrated in assets with more information as this will optimize returns (Van Nieuwerburgh and Veldkamp, 2009, 2010). Empirically, Choi, Fedenia, Skiba, and Sokolyk (2017) find a positive relation between foreign market portfolio concentration and risk-adjusted returns for higher learning capacity (smart) investors.

In this paper, I investigate whether investors with lower learning capacity also improve returns from foreign market portfolio concentrations. Obtaining data to investigate this research question has proven difficult in the past as it requires portfolio holdings for many investors in a foreign market over a long period of time. In this paper, I investigate all of the portfolios held by foreign (non-Norwegian) investors on the OSE from January 1993-July 2006 from the Central Depository (the OSE VPS). There are 38,776 unique foreign institutional investors and 11,081 unique foreign retail investors with a combined 1.5 million investor-month portfolio holdings from 152 different countries. I identify foreign retail investors from residential addresses and foreign institutional investors from main office addresses.

My main empirical finding is that low learning capacity investors reduce risk-adjusted returns from foreign market portfolio concentrations. I use two measures of learning capacity. First, I follow Michaely and Shaw (1994), Hanley and Wilhelm (1995), and Aggarwal, Prabhala, and Puri (2002) and measure low learning capacity for the retail investor classification (as

opposed to institutional investor classification). I find that retail investors who increase foreign market portfolio concentration by one standard deviation reduce annual risk-adjusted returns by -3.29%. This is significantly lower than institutional investors who increase annual risk-adjusted returns by +1.57% from increasing foreign market portfolio concentration by one standard deviation.

In addition, I follow Coval and Moskowitz (2001), Bernile, Kumar, and Sulaeman (2009), and Baik, Kang, and Kim (2010) and measure investor learning capacity based on investor geographical proximity. Since there is quite an overlap in geographical and cultural proximity, I also measure learning capacity based on investor cultural closeness as documented by Hofstede (2003, 2018) and Hofstede and Hofstede (2004). I find that investors who are distant from Norway (lower learning capacity investors) reduce annual risk-adjusted returns by -1.13% by increasing portfolio concentration by one standard deviation. This is significantly lower than closer (higher learning capacity) investors who increase annual risk-adjusted returns by +1.32% by increasing portfolio concentration by one standard deviation.

I follow Choi et al. (2017) and measure portfolio concentration as the sum of the absolute deviation in investor portfolio weights from the market value weights. I investigate the relation between monthly portfolio excess returns and concentration while controlling for standard risk factors (RM-RF, SMB, HML, and Momentum), investor size (portfolio values), the number of unique companies in the investor portfolios, investor types, as well as various fixed effects (Choi et al., 2017). Any relation between concentration and return is in excess of what is expected based on the differences in portfolio values, investor types, the number of actual investments, portfolio risk characteristics, and year effects.

I make three important contributions to the literature. Firstly, I find that investors with arguably lower learning capacity lose money from portfolio concentration. Choi et al. (2017) determine that investors with higher learning capacity earn positive risk-adjusted-returns from foreign market portfolio concentration. These authors are limited to investigating institutional investors with company holdings equal to or larger than 0.1% of the issued shares. I first replicate the results in Choi et al. (2017) for a single market (the OSE). I then demonstrate that the investors not included in Choi et al. (2017) (foreign retail investors) experience the opposite effect from portfolio concentration. This finding extends Odean (1998a, 1998b) and Barber and Odean (2000) by suggesting that retail investors' exhibit overconfidence in portfolio formations. This finding also extends to Michaely and Shaw (1994), Hanley and Wilhelm (1995), and Aggarwal et al. (2002) by further documenting that institutional investors have a higher leaning capacity than retail investors. This is an important contribution as it confirms that concentration is a poor strategy for investors with low learning capacity.

In addition, I contribute by confirming that cultural and geographical proximity are important indicators of information learning in portfolio concentration. Choi et al. (2017) measure learning capacity based on investor types, such as hedge fund vs. mutual fund. I argue that investors that are geographically and/or culturally closer to Norway have a higher learning capacity about the Norwegian market than other foreign investors. I find that investors who are geographically and/or culturally closer to Norway earn higher returns than other foreign investors from concentrating portfolios on the OSE. I extend Van Nieuwerburgh and Veldkamp (2009, 2010) and Choi et al. (2017) by providing additional evidence linking portfolio concentration to returns for skilled investors.

Finally, I contribute to the literature investigating smart money. Gruber (1996) and Zheng (1999) find that some smart investors are able to predict which funds will earn higher returns in the future (smart money). I contribute to Gruber (1996) and Zheng (1999) by further documenting the existence of smart money. I determine that smart investors increase while less informed investors decrease risk-adjusted returns from foreign market portfolio concentration.

I only study those shares held on the OSE, so it is possible that investors hold other assets in addition to the portfolios investigated. To evaluate how the OSE portfolios contribute to broader held international portfolios, I also investigate information ratios in addition to the portfolio returns. The information ratio evaluates whether investors generate OSE portfolios that contribute positively to well-diversified international portfolios (Treynor and Black, 1973). The results remain largely unchanged. Institutional investors increase, while retail investors decrease information ratios from foreign market portfolio concentration. Investors who are closer to Norway (geographically and/or culturally) also obtain significantly higher information ratios than more distant investors. I conclude that investors with higher learning capacity can improve returns by concentrating portfolios. Investors with lower learning capacity reduce returns from portfolio concentration.

I organize the rest of the article as follows. Section II presents the literature review and hypothesis development. Section III and IV provide the institutional setup and data. Section V focuses on methodology. Section VI reports the empirical results, while Section VII provides my conclusions.

II. Literature Review and Hypothesis Development

Traditional asset pricing theory suggests that holding the market portfolio through international diversification optimizes the portfolio risk-return characteristics (Markowitz, 1952, 1959) and Tobin (1958). In contrast, Van Nieuwerburgh and Veldkamp (2009, 2010) demonstrate how investors learn about assets prior to investing. With information learning, rational investors will seek optimization by concentrating their portfolios where they have greater international information.

Many studies have empirically investigated the benefits from international diversification. Levy and Sarnat (1970) find that international diversification significantly improves portfolio risk-return characteristics. French and Poterba (1991) argue that international diversification is limited by investor choices and not by institutional constraints. Harvey (1995) confirms that international diversification provides opportunities for portfolio risk return optimization as international markets are not perfectly correlated. De Santis and Gerard (1997) determine that the average gain to an U.S. investor from international diversification is about 2.1% per year.

Many studies also investigate whether domestic investors have an information advantage over foreign investors in portfolio formation. Kang and Stulz (1997) investigate ownership in Japanese firms by non-Japanese investors without finding return differences between foreign and domestic investors. Dvorak (2005), using transaction data from Indonesia, finds that domestic investors earn higher returns on short and medium-term investments, but lower returns on long-term investments. Binay (2005) confirms that institutional investors in the U.S. are informed and, as such, generate positive risk-adjusted portfolio returns. Bernile et al. (2009) determine that local investors have an informational advantage over non-local investors. Ferreira, Matos,

Pereira, and Pires (2017) argue that domestic institutions have trading patterns consistent with information advantages.

Fewer papers investigate whether concentrated portfolio formation improves risk-adjusted returns. Coval and Moskowitz (2001) and Kacperczyk, Sialm, and Zheng (2005) investigate actively managed U.S. mutual funds and find that more concentrated funds have higher risk-adjusted returns. Ivković, Sialm, and Weisbenner (2008) examine retail investors in the U.S. and find a positive relation between portfolio concentration and risk-adjusted returns. Kramer (2012) confirms that retail investors who self-manage have more concentrated portfolios than retail investors who obtain help from financial advisors. Kramer (2012) does not, however, find risk-adjusted return differences between retail investors with and without financial advisors. Choi et al. (2017) investigate the portfolio holdings of large institutional investors and find that concentrated investment strategies in international markets provide positive risk-adjusted returns. Gruber (1996) and Zhang (1999) suggest that some investors are able to predict which funds will do better in the future as there is a positive relation between fund cash inflows and subsequent fund returns.

Based on Ivković et al. (2008) and Choi et al. (2017), I expect that those investors who have chosen to concentrate their portfolio holdings in a foreign market have more information and, as such, earn positive risk-adjusted returns. I formalize this as Hypothesis H1.

> H1: There is a positive relation between foreign market portfolio concentration and risk-adjusted returns for investors on the OSE.

Choi et al. (2017) find that investors with higher learning capacity are more likely to concentrate portfolio holdings in foreign markets. Choi et al. (2017) investigate investor-learning capacity using institutional investor types, such as mutual funds vs. hedge funds. A large area of the literature also documents an informational advantage of institutional investors over retail investors. Michaely and Shaw (1994), Hanley and Wilhelm (1995), and Aggarwal et al. (2002) confirm that institutional investors are more informed (have a higher learning capacity) than retail investors when investing in Initial Public Offerings (IPOs). Many studies also note trading biases experienced by retail investors. Odean (1998a) and Barber and Odean (2000) find that retail investors exhibit overconfidence in their portfolio formations by trading excessively. Odean (1998b) similarly argues that retail investors destroy portfolio value by holding on to losing shares for longer than winning shares (the disposition effect). Based on Michaely and Shaw (1994), Hanley and Wilhelm (1995), Odean (1998a, 1998b), Barber and Odean (2000), and Aggarwal et al. (2002), I expect institutional investors to have a higher learning capacity than retail investors.

A large area of the literature also explores how proximity is a source of informational advantage. Coval and Moskowitz (2001), Bernile et al. (2009), and Baik et al. (2010) find that geographically close institutional investors have a greater learning capacity than more distant institutional investors in portfolio formation. Grinblatt and Keloharju (2001) similarly determine that investors prefer to hold shares in companies that are geographically close, communicate in the same language, and have CEOs with the same cultural background as themselves. Arguably, this preference is driven by an informational advantage. Hofstede (2003, 2018) and Hofstede and Hofstede (2004) confirm that people from Northern Europe score very similarly on the Hofstede cultural dimensions (individualism, power distance, masculinity, uncertainty avoidance, long-

term orientation, and indulgence). Based on Coval and Moskowitz (2001), Bernile et al. (2009), Baik et al. (2010), Grinblatt and Keloharju (2001), Hofstede (2003, 2018), and Hofstede and Hofstede (2004), I expect that geographically and culturally close investors have a higher learning capacity than more distant investors.

If foreign investors concentrate portfolio holdings due asset learning, there should be a stronger relation between portfolio concentration and risk-adjusted returns for higher learning capacity (institutional and geographically/culturally close) investors on the OSE. I formalize this as Hypothesis H2.

> H2: Investors with higher learning capacity earn higher risk-adjusted returns than other investors from foreign market portfolio concentration on the OSE.

III. Institutional Setup

The Oslo Stock Exchange (OSE) is similar to the U.S. and other European stock exchanges in most aspects as the OSE is regulated under the European Union (EU) commission regulation of financial instruments.[1] Approximately 50% of the brokerage firms that provide trading on the OSE are non-Norwegian. As such, international investors have easy access to listed companies. Some international companies also seek a listing on the OSE due to its strong global position in the energy, shipping, and seafood industries. The OSE differs from some other exchanges in that companies listing on the OSE must, as part of the listing process, register all investor shareholdings in the OSE VPS database (the share depository). From this data, I obtain all investor share holdings at the end (beginning) of each calendar month from December 1992

[1] See the description from the OSE at https://www.oslobors.no/ob_eng/.

(January 1993) to June 2006 (July 2006). The OSE VPS classifies investors into 72 different investor codes (with the broad categories including domestic government, domestic financial corporations, domestic non-financial corporations, foreign institutions, and foreign retail).

IV. Data

From the OSE VPS database, I obtain daily stock prices and beginning of the month investor portfolio holdings for all investors from January 1993-July 2006. I obtain traditional portfolio factor returns (RM-RF, HML, SMB, and Momentum) for the OSE from Ødegård (2017).

A. Sample Formation

Table I lists the number of companies with equity trading on the OSE over the sample period. Column 1 reports the sample years. Column 2 provides the number of companies. I apply standard filters by dropping companies with low trading volume (less than 20 trading days), lower price stocks (share price below 10 NOK), and companies with a total value below 1 million NOK ($179,200 USD) (Ødegård, 2016). Column 3 presents the percent of total OSE value held by foreign investors averaged over the year. From Column 3, we note the average foreign ownership is very stable at around 20%-30%. The monthly variation within the year is also stable with a low standard deviation (Column 4). Foreign ownership drops some in aggregate immediately following the information technology bubble in the early 2000s.

Insert Table I about here.

B. Portfolio Concentration

I measure portfolio concentration following Choi et al. (2017) as the investor portfolio deviation from the market portfolio. Appendix Table A1 illustrates how I calculate portfolio concentration. Column 1 reports the companies trading on the exchange. Column 2 provides the company weights in the example market value-weighted portfolio. Column 3 presents the company value weights in the example investor portfolio, while Column 4 lists the absolute difference between the investor weights and the market weights in each company. *Concentration* is calculated as half of the cumulated absolute differences between the investor weights and the market weights. A *Concentration* of zero indicates that the investor holds the market value-weighted portfolio. A higher *Concentration* suggests that the investor deviates more from the market value-weighted portfolio.

C. Descriptive Statistics

Table II provides the descriptive statistics for the 1,556,740 investor-month observations for foreign investors on the OSE from 1993-2006. *Return* is the investor monthly value-weighted portfolio return in excess of the risk-free rate during the month. *Concentration* is the absolute cumulated difference in the investor portfolio weights from the OSE market portfolio value weights divided by two at the beginning of the calendar month (see Appendix Table A1 for a detailed explanation). *Portfolio* is the investor dollar portfolio value calculated as the number of shares times the share prices at the beginning of the calendar month in millions of USD. *N. Companies* are the number of unique companies in the investor monthly portfolio at the beginning of the calendar month. *Institutional* is a binary variable that takes a value of one (and zero otherwise) for institutional investors. I classify investors from the OSE VPS sector codes

900 to 989 as foreign institutional investors. I classify investors from the OSE VPS sector codes 990 to 999 as foreign retail investors. I drop all Norwegian investors with a foreign address. *Close* is a binary variable that takes the value of one (and zero otherwise) for investors who are regarded as high learning as they are geographically and/or culturally close to Norway. Hofstede (2003, 2018) finds that investors from Northern Europe (Denmark, Finland, Iceland, Sweden, the Faroe Islands, and the Netherlands) are culturally (in addition to geographically) close to Norway on the six dimensions of cultural closeness (Hofstede and Hofstede, 2004).[2]

Insert Table II about here.

The average *Return, Concentration, Portfolio, N. Companies, Institutional*, and *Close* are 0.962%, 0.95, $2.846 million USD, 1.79 companies, 85% *Institutional*, and 54% *Close*, respectively. An average *Concentration* of 0.95 suggests that most investors are highly concentrated. For example, an investor holding their entire OSE portfolio in one company with a 5.0% market value weight will have a *Concentration* of 0.95. The average number of companies held in the portfolio is also very low at 1.79. This is driven by a large number of investors holding shares in one single company.

Table II, Panel A also reports the 5^{th}, 25^{th}, 50^{th}, 75^{th}, and 95^{th} percentiles on all of the variables. Most investors have a relatively low *Portfolio,* although there are a small number of investors with very large holdings. *Returns* are more evenly distributed with 90% of all monthly

[2] For robustness, I find the same result with both a more narrow definition of *Close* = 1 for only Scandinavian investors (Denmark and Sweden) and a more wide definition of *Close* = 1 for all Northern European investors (Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, Sweden, the Faroe Islands, and the Netherlands).

portfolio returns falling between -20% to +23%. *Concentration* and *N. Companies* are also highly skewed with most investors holding shares in only one company.

Table II, Panel B provides the correlation matrix of all of the variables. As expected, there is a negative correlation between *N. Companies* and *Concentration* and a positive correlation between *N. Companies* and *Portfolio*.

Table III reports descriptive statistics at the investor ID level. I define *Mean Return*, *Mean Concentration*, *Mean Portfolio*, and *Mean N. Companies* as the average *Return*, *Concentration*, *Portfolio*, and *N. Companies* by each unique investor ID over the sample period. The *Information Ratio* is calculated as Average (*RP-RM*)/Standard deviation (*RP-RM*). *RP* is the unadjusted monthly value-weighted investor portfolio return. *RM* is the unadjusted monthly value-weighted market portfolio return from Ødegård (2017).

Insert Table III about here.

Table IV provides the descriptive statistics for market level variables by the 163 monthly observations from January 1993-July 2006. The average *RM-RF, SMB, HML,* and *MOM* for the OSE are 1.93%, 1.28%, 0.31%, and 0.46%, respectively.

Insert Table IV about here.

Table V presents investors by country as reported by the OSE VPS.[3] There are investors from a total of 152 different countries holding shares on the OSE. Most foreign investors on the

[3] I report the countries directly with no adjustments as listed in the OSE VPS database. The OSE VPS reports are very detailed with separate nationality codes for investors from, for instance, the Isle of Man.

OSE come from Denmark, Sweden, the U.K., the U.S., Germany, the Netherlands, and France with 410,384 (26.4%), 376,923 (24.2%), 175,215 (11.3%), 167,716 (10.8%), 70,288 (4.5%), 31,584 (2.0%), and 23,169 (1.5%) investor-month observations (% of the sample) each, respectively.

Insert Table V about here.

Mean Country Concentration, Mean Country Portfolio, *Mean Country N. Companies*, and *Mean Country Return* are the mean *Concentration*, *Portfolio, N. Companies,* and *Return* by all investor-month observations across each reported country, respectively. Investors from Cyprus, Bermuda, Luxemburg, and the Cayman Islands hold very large portfolio values, on average, (*Mean Country Portfolio*). Investors from the U.S. and the U.K. own the most shares in cumulated value terms with 34.7% and 13.2% each, respectively (*Mean Country Value).*

V. Methodology

To investigate Hypothesis 1 (i.e., there is a positive relation between foreign market portfolio concentration and risk-adjusted returns for investors on the OSE), I follow the methodology in Choi et al. (2017) by studying the relation between *Return* and *Concentration* while controlling for investor size (*Portfolio*) and standard risk factors (*RM-RF, SMB, HML,* and *MOM*), as well as various fixed effects. As I investigate many investors with very few Norwegian shares in their portfolios, I additionally control for the actual number of unique companies in the investor portfolio (*N. Companies*). To investigate the relation between *Return* and *Concentration*, I use a standard OLS model as Equation (1) for each investor (*i*) in each

calendar month (*t*). I investigate all of the equations observing *Portfolio*, *Concentration*, and *N. Companies* at the beginning of the calendar month (*t*) and *Return* during the calendar month (*t*).

$$Return_{it} = \alpha + \beta_1[Concentration_{it}] + \beta_2[Portfolio_{it}] + \beta_3[N.\ Companies_{it}] + \beta_4[RM\text{-}RF_t] + \beta_5[SMB_t] + \beta_6[HML_t] + \beta_7[MOM_t] + Year\ Fixed\ Effects + Investor\ Type\ Fixed\ Effects + e_{it} \quad (1)$$

To investigate Hypothesis 2 (i.e., investors with higher learning capacity earn higher risk-adjusted-returns than other investors from foreign market portfolio concentration on the OSE), I interact *Concentration* with *Institutional* in Equation (2) and with *Close* in Equation (3). I then determine whether the interaction terms (*Concentration * Institutional*) and (*Concentration * Close*) are positively related to *Return*.

$$Return_{it} = \alpha + \beta_1[Concentration_{it}] + \beta_2[Concentration_{it} * Institutional_i] + \beta_3[Institutional_i] + \beta_4[Portfolio_{it}] + \beta_5[N.\ Companies_{it}] + \beta_6[RM\text{-}RF_t] + \beta_7[SMB_t] + \beta_8[HML_t] + \beta_9[MOM_t] + Year\ Fixed\ Effects + Investor\ Type\ Fixed\ Effects + e_{it} \quad (2)$$

$$Return_{it} = \alpha + \beta_1[Concentration_{it}] + \beta_2[Concentration_{it} * Close_{it}] + \beta_3[Close_{it}] + \beta_4[Portfolio_{it}] + \beta_5[N.\ Companies_{it}] + \beta_6[RM\text{-}RF_t] + \beta_7[SMB_t] + \beta_8[HML_t] + \beta_9[MOM_t] + Year\ Fixed\ Effects + Investor\ Type\ Fixed\ Effects + e_{it} \quad (3)$$

VI. Empirical Results

A. Portfolio Concentration and Risk-adjusted Returns

Hypothesis 1 predicts that there is a positive relation between foreign market portfolio concentration and risk-adjusted returns for investors on the OSE. In Table VI, I regress *Return* on *Concentration* and the controls in a standard OLS model for all foreign investors on the OSE from January 1993-July 2006 using Equation (1). *Return* is the monthly value-weighted investor portfolio return in excess of the risk-free rate. *Concentration* is the absolute cumulated difference in the investor portfolio weights from the OSE market portfolio value weights.[4] In Column 1 in Table VI, there is a positive relation between *Concentration* and *Return*. The interpretation is that investors who increase *Concentration* by one standard deviation will increase *Return* by +0.10% (1.057 * 0.095). A monthly increase in *Return* of +0.10% is equivalent to an annual increase in *Return* of +1.21%.

Insert Table VI about here.

I control for the same variables as Choi et al. (2017) by also including the traditional risk factors (*RM-RF, SMB, HML,* and *MOM*) and the investor portfolio values (*Portfolio*), as well as the investor type and the year fixed effects in the analysis. I additionally control for the number of actual investments (*N. Companies)* to make sure that the results are not driven by investors holding shares in a few companies. *Portfolio* and *N. Companies* are both positively related to *Return*. Consistent with Hypothesis 1, I find that there is a positive relation between foreign market portfolio concentration and risk-adjusted returns for investors on the OSE.

[4] See Appendix Table 1 for a detailed example as to how I measure *Concentration*.

Hypothesis 2 predicts that investors with higher learning capacity earn higher risk-adjusted returns than other investors from the foreign market portfolio concentration on the OSE. Based on Michaely and Shaw (1994), Hanley and Wilhelm (1995), and Aggarwal et al. (2002), I investigate higher learning capacity as an institutional investor classification.

In Column 2 of Table VI, I regress *Return* on *Concentration* and the interaction term (*Concentration* * *Institutional*) for all of the foreign investors on the OSE in a standard OLS model using Equation (2). *Institutional* is a binary variable that takes a value of one for institutional investors and zero for retail investors. The interpretation is that institutional investors who increase *Concentration* by one standard deviation increase *Return* by +0.13% [(-2.878 + 4.267) * 0.095]. A monthly increase in *Return* of +0.13% is equivalent to an annual increase in *Return* of +1.57%. This is significantly higher than retail investors who reduce *Return* by -0.27% after increasing *Concentration* by one standard deviation (-2.878 * 0.095). A monthly decrease in *Return* of -0.27% is equivalent to an annual decrease in *Return* of -3.29%.

Concentration and *N. Companies* are naturally negatively correlated as they are both calculated from the investor portfolio. In Column 3 of Table VI, I drop *N. Companies* from the regression to ensure multicollinearity is not driving the results. The results remain unchanged. I conclude that the results are not driven by the correlation between *Concentration* and *N. Companies*.

It could be argued that portfolio concentration is a function of investment opportunity where smaller investors are concentrated as they cannot afford to diversify. In Column 4 of Table VI, I drop all of the investors in the lowest decile on *Portfolio* from the analysis. The results remain unchanged. It could similarly be argued that the results are driven by the large portfolio investors from potential tax havens, such as the Cayman Islands, Bermuda, and the Bahamas. In

Column 5 of Table VI, I drop all of the investors in the highest decile on *Portfolio* from the analysis. The results remain unchanged. I conclude that the relation between *Concentration* and *Return* is not driven by smaller investors who are unable to afford diversification or larger investors from tax havens.

Finally, it could be argued that the results are driven by investors holding a large fraction of one single company. Choi et al. (2017) are limited to investigating institutional investors with company holdings equal to or larger than 0.1% of issued shares. In Column 6 of Table VI, I drop all of the investors who hold more than 0.1% of issued shares in single company portfolios. The results remain unchanged. I conclude that the results are not driven by large investors in one single company.

Based on Coval and Moskowitz (2001), Bernile et al. (2009), Baik et al. (2010), Grinblatt and Keloharju (2001), Hofstede (2003, 2018), and Hofstede and Hofstede (2004), I also investigate higher learning capacity as those investors who are geographically and/or culturally close to Norway. In Table VII, I regress *Return* on *Concentration* while interacting *Concentration* with *Close* for foreign investors on the OSE using Equation (3). In Column 1 of Table VII, *Close* is a binary variable that takes a value of one (zero else) for investors from countries that score similarly to Norwegian investors on the Hofstede (2018) closeness measures (Denmark, Finland, Iceland, Sweden, the Faroe Islands, and the Netherlands. All of these countries are also geographically very close to Norway. Both *Concentration* and the interaction term (*Concentration* * *Close*) are positively related to *Return*. The interpretation is that investors with *Close* = 1 who increase *Concentration* by one standard deviation will increase *Return* by +0.17% [(0.788 + 0.953) * 0.095]. A monthly increase in *Return* of +0.17% is equivalent to an annual increase in *Return* of +2.0%.

Insert Table VII about here.

In Columns 2 and 3, I replace *Close* with a more narrow definition as *Close* = 1 for investors from Scandinavia (Denmark and Sweden) and a wider definition as *Close* = 1 for investors from Northern Europe (Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, Sweden, the Faroe Islands, and the Netherlands), respectively. The results are slightly stronger with the narrower definition and slightly weaker with the wider definition of *Close* = 1.

In Column 4, I replace *Close* = 0 (otherwise one) for all of the investors who score the least similar to Norwegian investors on the Hofstede (2018) closeness measures (Bulgaria, China, Colombia, the Czech Republic, Japan, the Democratic People's Republic of Korea, the Republic of Korea, Mexico, Romania, Russia, Serbia, Singapore, Slovakia, and Venezuela) (Hofstede, 2003; Hofstede and Hofstede, 2004). Now, the results are very different. Investors with *Close* = 0 who increase *Concentration* by one standard deviation will reduce *Return* by -0.094% [(-0.987) * 0.095]. A monthly decrease in *Return* of -0.094% is equivalent to an annual decrease in *Return* of -1.13%. Investors with *Close* = 1 who increase *Concentration* by one standard deviation will increase *Return* by +0.109% [(-0.987 + 2.138) * 0.095]. A monthly increase in *Return* of +0.109% is equivalent to an annual increase in *Return* of +1.32%. Investors who are culturally or geographically distant from Norway lose substantially from a concentration on the OSE.

The results are consistent with Hypothesis 2. Investors with higher learning capacity earn higher risk-adjusted returns than other investors with a foreign market portfolio concentration on the OSE. I conclude that a portfolio concentration increases risk-adjusted returns for investors

with higher learning capacity and reduces risk-adjusted returns for investors with lower learning capacity.

B. Information Ratios

It is possible that investors hold OSE portfolios as part of internationally diversified portfolios. To measure how the OSE portfolio contributes to a more diversified overall portfolio, I follow Treynor and Black (1973) and Ivković et al. (2008) by investigating investor portfolio information ratios. For each investor, I calculate the *Information Ratio* over the sample period as Average (*RP-RM*)/Standard deviation (*RP-RM*).[5] In Column 1 of Table VIII, I regress *Information Ratio* on *Mean Concentration* and the controls for all of the foreign investors on the OSE in a standard OLS model. I only calculate one *Information Ratio* per investor. As independent variables, I calculate the *Mean Concentration, Mean Portfolio,* and *Mean N. Companies* as the average *Concentration, Portfolio, and N. Companies* by each unique investor ID over the sample period, respectively.

Insert Table VIII about here.

In Column 1 in Table VIII, there is a positive relation between *Information Ratio* and *Mean Concentration*. The interpretation is that investors who increase *Mean Concentration* by one standard deviation will increase the *Information Ratio* by 0.02 (0.221 * 0.088). This is economically significant given that the average *Information Ratio* is -0.14. I only include the

[5] Where *RP* and *RM* are the unadjusted portfolio and market monthly value-weighted returns, respectively.

40,384 investors with more than six months of portfolio observations to obtain meaningful information ratios.

In Column 2 I interact *Mean Concentration* by *Institutional*. The interpretation is that institutional investors who increase *Mean Concentration* by one standard deviation increase the *Information Ratio* by 0.027 [(-0.489 + 0.796) * 0.088]. This is in stark contrast to retail investors who reduce the *Information Ratio* by -0.043 [(-0.489) * 0.088] from increasing *Mean Concentration* by one standard deviation.

In Column 3, I interact *Mean Concentration* with *Close* (where *Close* is a binary variable that takes a value of one for investors who are regarded as high learning as they are geographically and/or culturally close to Norway based on the Hofstede (2018) six dimensions of cultural closeness). The interpretation is that *Close* investors who increase *Mean Concentration* by one standard deviation increase the *Information Ratio* by 0.023 [(0.202 + 0.061) * 0.088]. This is significantly higher than more distant investors (*Close* = 0) who increase the *Information Ratio* by 0.018 when increasing *Mean Concentration* by one standard deviation [0.202 * 0.088]. However, I do not find that the investors, who score the least, similar to the Norwegian investors on the Hofstede (2018) closeness measures, significantly decrease the *Information Ratio* from increasing *Mean Concentration*.

I conclude that investors with higher learning capacity who concentrate their portfolio on the OSE increase their information ratios. Investors with the lowest learning capacity (retail investors) reduce their OSE information ratios from portfolio concentration.

VII. Conclusion

In traditional asset pricing theory, investors optimize portfolio risk-return characteristics by holding the market portfolio. In practice, investors concentrate portfolio holdings in a small number of assets. More recently, it is argued that this concentration is a rational response driven by information learning. Choi et al. (2017) find that institutional investors improve returns by concentrating portfolios in foreign markets and that the effect is greater for investors with higher learning capacity.

In this paper, I investigate whether investors with lower learning capacity also improve returns from foreign market portfolio concentration. Investigating all of the foreign investors on the OSE from January 1993-July 2006, I disentangle which investors earn positive risk-adjusted returns and which do not. I find that asset learning is the primary factor in earning risk-adjusted returns for foreign investors. Investors who are likely to be more informed about the Norwegian market earn excess risk-adjusted returns from portfolio concentration. I attribute these findings to investors becoming informed about the OSE and then concentrating their portfolios.

The empirical implications of these findings suggest that investors should partly determine portfolio weights based on asset learning. Higher learning capacity investors can benefit from becoming internationally informed. Lower learning capacity investors should take more care when concentrating investments.

The theoretical implications of these findings suggest that future models should incorporate asset learning in portfolio formation. Concentrating foreign portfolio investment is a rational and profitable strategy for investors with higher learning capacity. However, only those investors with higher learning capacity should concentrate. For the average lower learning capacity investor, it is better to optimize portfolios through diversification.

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Table I. Companies per Year

Column 1 lists the sample years. Column 2 reports the number of companies traded on the OSE after dropping companies with low trading volume (less than 20 trading days), penny stocks (share price less than 10 NOK or $1.792 USD), and companies with a total value below 1 million NOK ($179,200 USD). Column 3 presents the percent of total OSE value held by foreign investors as an average over the year. Column 4 provides the standard deviation in the percent of total OSE value held by foreign investors over the year.

1	2	3	4
	Companies	Foreign Ownership	
Year	N	Mean	St.Dev
1993	106	18.581	0.957
1994	126	19.328	3.842
1995	131	27.813	0.665
1996	147	25.278	7.822
1997	177	14.427	2.808
1998	189	21.691	6.348
1999	169	21.454	2.933
2000	174	27.580	1.568
2001	152	7.461	2.778
2002	130	17.962	2.157
2003	116	19.850	5.167
2004	131	27.120	1.835
2005	163	29.432	0.529
2006	173	31.020	0.549

Table II. Investor-Month Descriptive Statistics

Table II presents the descriptive statistics for the investors trading on the OSE. *Return* is the value-weighted investor monthly portfolio return (in excess of the risk-free rate) during the calendar month. *Concentration* is the investor cumulated absolute monthly company portfolio weights as deviation from the market value weights at the beginning of the calendar month (see Appendix Table A1 for a detailed description of *Concentration*). *Portfolio* is the total investor monthly portfolio value in millions of USD at the beginning of the calendar month. *N. Companies* are the total number of unique companies in the investor monthly portfolio at the beginning of the calendar month. *Close* is the binary variable that takes a value of one for investors who are geographically close and/or from countries that score similar to Norwegian investors on the Hofstede closeness measures (Denmark, Finland, Iceland, the Faroe Islands, the Netherlands, and Sweden) (Hofstede, 2003, 2018; Hofstede and Hofstede, 2004). All of the variables are defined in Appendix Table A2. Panels A and B report the summary statistics and the correlation matrix, respectively.

Panel A. Summary

	N	Mean	St.Dev	5th	25th	50th	75th	95th
Return	1,556,740	0.962	13.490	-19.541	-5.781	0.224	6.966	22.562
Concentration	1,556,740	0.953	0.095	0.752	0.954	0.992	0.998	1.000
Portfolio	1,556,740	2.846	52.679	0.000	0.000	0.002	0.012	2.053
N. Companies	1,556,740	1.793	4.136	1.000	1.000	1.000	1.000	4.000
Institutional	1,556,740	0.848	0.359	0.000	1.000	1.000	1.000	1.000
Close	1,556,740	0.541	0.498	0.000	0.000	1.000	1.000	1.000

Panel B. Correlation Matrix

	Return	Concent.	Portfolio	N. Comp.	Inst.	Close
Return	1.000					
Concentration	-0.007	1.000				
Portfolio	0.000	-0.173	1.000			
N. Companies	0.006	-0.475	0.415	1.000		
Institutional	0.022	-0.047	0.022	0.069	1.000	
Close	0.006	0.171	-0.047	-0.119	-0.043	1.000

Table III. Investor ID Descriptive Statistics

Table III presents the descriptive statistics by investor ID. *Mean Return, Mean Concentration, Mean Portfolio,* and *Mean N. Companies* are the average *Return, Concentration, Portfolio,* and *N. Companies* by each unique investor ID. *Close* is the binary variable that takes a value of one for investors who are geographically close and/or from countries that score similar to Norwegian investors on the Hofstede closeness measures (Denmark, Finland, Iceland, the Faroe Islands, the Netherlands, and Sweden) (Hofstede, 2003, 2018; Hofstede and Hofstede, 2004). *Institutional* is a binary variable that takes a value of one for institutional investors and zero for retail investors. The *Information Ratio* is calculated as Average (*RP-RM*)/Standard deviation (*RP-RM*). *RP* is the unadjusted monthly value-weighted investor portfolio return and RM is the unadjusted monthly value-weighted market portfolio return. For the *Information Ratio*, investors with less than six months of trading history are dropped. *Information Ratio* is winsorized at the 2.5% level.

	N	Mean	St.Dev
Mean Return	49,857	0.755	4.575
Mean Concentration	49,857	0.952	0.088
Mean Portfolio	49,857	1.769	30.742
Mean N. Companies	49,857	1.519	2.648
Close	49,857	0.521	0.500
Institutional	49,857	0.778	0.416
Information Ratio	40,384	-0.138	0.216

Table IV. Risk Factors

Table IV provides the descriptive statistics for the risk factors on the OSE. All of the variables are defined in Table Appendix A2. *RM-RF* is the value-weighted market return minus the risk-free rate of return. *SMB* is the average return on the small stock portfolio minus the average return on the big stock portfolio (Fama and French, 1993). *HML* is the average return on the value portfolio minus the average return on the growth portfolio (Fama and French, 1993). *MOM* is the difference in return on winners and losers (Carhart, 1997). *RM-RF*, *SMB, HML,* and *MOM* are obtained from Ødegård's data library http://finance.bi.no/~bernt/.

Variable	N	Mean	St.Dev.
RM-RF	163	1.929	5.656
SMB	163	1.284	4.089
HML	163	0.306	5.386
MOM	163	0.460	4.962

Table V. Investors by Country

Table V reports the descriptive statistics by investor country (territory) as reported by the OSE VPS from 1993-2006. Institutional and retail investors report the main office and residential address, respectively. *Investor Month Observations* are the cumulated number and percentage of unique investor-month portfolio observations cumulated by country. *Mean Country Concentration*, *Portfolio*, *N. Companies*, *Return*, and *Institutional* are the averages for all investor-month observations by each country. *Mean Country Value* is the total ownership percentage in value by investors from each country over the sample period.

	Investor Month		Mean Country					
Country		**Observations**	**Conct.**	**Portfolio**	**N. Comp.**	**Return**	**Inst.**	**Value**
Denmark	410,384	26.362%	0.979	0.365	1.221	0.666	88.983%	4.124%
Sweden	376,923	24.212%	0.958	0.523	1.389	1.453	77.446%	5.543%
U.K.	175,215	11.255%	0.946	7.113	2.315	0.723	87.563%	13.155%
USA	167,716	10.774%	0.934	8.924	2.255	1.022	90.767%	34.668%
Germany	70,288	4.515%	0.955	1.439	1.761	0.656	80.965%	0.919%
Netherlands	31,584	2.029%	0.961	3.269	1.947	0.934	84.568%	4.999%
France	23,169	1.488%	0.929	5.047	2.445	1.215	84.712%	6.470%
Switzerland	22,486	1.444%	0.907	6.058	5.182	1.367	93.970%	2.410%
Australia	20,459	1.314%	0.931	0.773	1.817	0.436	54.074%	0.506%
Luxembourg	19,171	1.231%	0.837	13.946	7.463	1.046	99.327%	2.835%
Finland	18,870	1.212%	0.956	1.601	1.869	0.628	78.633%	0.496%
Hong Kong	17,401	1.118%	0.977	0.567	1.197	3.299	99.782%	0.757%
Canada	16,192	1.040%	0.953	0.439	1.674	1.192	88.686%	0.301%
Belgium	15,943	1.024%	0.872	10.568	3.015	1.048	93.439%	0.641%
Japan	15,503	0.996%	0.854	1.643	2.689	0.973	99.594%	1.121%
Singapore	11,520	0.740%	0.967	1.582	1.213	0.104	86.441%	1.663%
Ireland	10,266	0.659%	0.852	3.445	2.995	0.630	79.982%	0.713%
Italy	8,044	0.517%	0.939	1.430	1.814	0.464	91.186%	0.309%
Jersey	3,253	0.209%	0.896	3.181	4.846	0.988	100.000%	0.349%
Bermuda	2,934	0.188%	0.929	18.349	2.778	0.923	97.035%	3.859%
Liberia	2,077	0.133%	0.983	3.915	2.249	2.027	98.170%	0.697%
Isle of Man	1,736	0.112%	0.932	11.084	2.981	0.573	95.277%	1.781%
Cayman I.	1,451	0.093%	0.879	22.250	3.622	1.256	99.931%	0.969%

Cyprus	766	0.049%	0.956	137.718	2.260	2.529	90.339%	8.828%
Bahamas	547	0.035%	0.880	10.225	3.505	0.509	92.322%	0.452%
Other	112,842	7.249%	0.941	1.562	1.704	0.890	89.817%	1.435%
Total	1,556,740	100.000%						100.000%

Table VI. Institutional Investors, Asset Learning, Portfolio Concentration, and Returns

Table VI reports the intercept coefficients and the robust clustered *t*-statistics in parentheses for the regressions of *Return* on *Concentration* and the controls for the 1,556,740 foreign investor-month portfolio observations on the OSE from 1993-2006. All of the variables are defined in Appendix Table A2. Column 3, 4, 5, and 6 drop *N. Companies* as a control, all of the investors in the lowest decile on *Portfolio*, all of the investors in the highest decile on *Portfolio*, and the investors with only one company portfolios and greater than 0.1% ownership, respectively. Standard errors are clustered by investors. Statistical significance at the 10%, 5%, and 1% level are indicated by *, **, and ***, respectively.

	1	2	3	4	5	6
Concentration	1.057***	-2.878***	-2.980***	-2.817***	-2.082***	-2.733***
	(13.780)	(-12.620)	(-13.150)	(-12.180)	(-8.010)	(-12.110)
Concentration * Institutional		4.267***	3.935***	4.469***	4.294***	4.050***
		(17.790)	(16.540)	(18.450)	(15.420)	(17.030)
Institutional		-3.669***	-3.335***	-4.128***	-3.645***	-3.418***
		(-15.040)	(-13.780)	(-16.690)	(-12.970)	(-14.180)
Ln (Portfolio)	0.031***	0.033***	0.040***	0.080***	0.013***	0.032***
	(10.940)	(11.880)	(14.730)	(21.480)	(3.430)	(11.220)
N. Companies	0.023***	0.025***		0.018***	0.208***	0.025***
	(9.810)	(10.410)		(8.700)	(19.580)	(10.230)
RM-RF	1.064***	1.064***	1.064***	1.037***	1.068***	1.063***
	(515.450)	(515.460)	(515.440)	(476.770)	(484.470)	(514.580)
SMB	0.099***	0.099***	0.099***	0.124***	0.101***	0.090***
	(31.910)	(31.910)	(31.900)	(36.700)	(30.890)	(29.460)
HML	-0.006**	-0.006**	-0.006**	-0.013***	-0.006**	-0.004
	(-2.530)	(-2.530)	(-2.500)	(-4.540)	(-2.180)	(-1.520)
MOM	-0.111***	-0.111***	-0.111***	-0.105***	-0.119***	-0.113***
	(-49.050)	(-49.050)	(-49.050)	(-42.820)	(-49.190)	(-49.600)
Constant	-0.662***	2.713***	2.882***	2.354***	1.488***	2.541***
	(-8.770)	(11.500)	(12.320)	(9.770)	(5.530)	(10.920)
N	1,556,740	1,556,740	1,556,740	1,401,066	1,401,066	1,524,161
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Investor type FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R2	21.9%	21.9%	21.9%	23.4%	21.4%	22.1%

Table VII. Close Investors, Asset Learning, Portfolio Concentration, and Returns

Table VII reports the intercept coefficients and robust clustered *t*-statistics in parentheses for the regressions of *Return* on *Concentration* and the controls for the 1,556,740 foreign investor-month portfolio observations on the OSE from 1993-2006. All of the variables are defined in Appendix Table A2. Standard errors are clustered by investors. Statistical significance at the 10%, 5%, and 1% level are indicated by *, **, and ***, respectively. In Column 1, 2, 3, and 4, *Close* is a binary variable that takes a value of one (zero else) for investors who are from countries that score similar to Norwegian investors on the Hofstede closeness measures (Denmark, Finland, Iceland, the Faroe Islands, the Netherlands, and Sweden), reside in Scandinavia (Denmark and Sweden), reside in Northern Europe (Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, Sweden, the Faroe Islands, and the Netherlands), and for investors who are from any country except for those that score the least similar to Norwegian investors on the Hofstede closeness measures (Bulgaria, China, Colombia, the Czech Republic, Japan, the Democratic People's Republic of Korea, the Republic of Korea, Mexico, Romania, Russia, Serbia, Singapore, Slovakia, and Venezuela) (Hofstede (2003, 2018; Hofstede and Hofstede, 2004).

	1	2	3	4
Concentration	0.788***	0.820***	0.792***	-0.987***
	(9.360)	(9.850)	(9.390)	(-4.270)
Concentration * Close	0.953***	0.956***	0.932***	2.138***
	(7.090)	(6.830)	(6.960)	(9.040)
Close	-0.831***	-0.820***	-0.810***	-1.383***
	(-6.980)	(-6.570)	(-6.830)	(-7.480)
Ln (Portfolio)	0.036***	0.037***	0.036***	0.032***
	(11.640)	(11.920)	(11.630)	(11.550)
N. Companies	0.022***	0.021***	0.022***	0.022***
	(9.750)	(9.730)	(9.740)	(9.850)
RM-RF	1.064***	1.064***	1.064***	1.064***
	(515.480)	(515.460)	(515.480)	(515.420)
SMB	0.099***	0.099***	0.099***	0.099***
	(31.920)	(31.920)	(31.920)	(31.930)
HML	-0.006**	-0.006**	-0.006**	-0.006**
	(-2.520)	(-2.520)	(-2.520)	(-2.520)
MOM	-0.112***	-0.112***	-0.112***	-0.111***
	(-49.080)	(-49.070)	(-49.080)	(-49.060)
Constant	-0.422***	-0.449***	-0.426***	0.654***
	(-5.200)	(-5.580)	(-5.240)	(3.530)
N	1,556,740	1,556,740	1,556,740	1,556,740
Year FE	Yes	Yes	Yes	Yes
Investor type FE	Yes	Yes	Yes	Yes
Close =	Hofstede	Scandinavia	Northern Europe	Non-Distant World
Adj. R2	21.9%	21.9%	21.9%	21.9%

Table VIII. Information Ratios

Table VIII reports the intercept coefficients and robust *t*-statistics in parentheses for the regressions of *Information Ratio* on *Mean Concentration* and the controls. All of the variables are defined in Appendix Table A2. Statistical significance at the 10%, 5%, and 1% level are indicated by *, **, and ***, respectively. All investors with less than six months of portfolio holdings are dropped. *Information Ratio* is winsorized at the 2.5% level.

	1	2	3
Mean Concentration	0.221***	-0.489***	0.202***
	(14.030)	(-11.630)	(10.310)
Mean Concentration * Institutional		0.796***	
		(17.670)	
Institutional		-0.734***	
		(-17.220)	
Mean Concentration * Close			0.061**
			(2.240)
Close			-0.049*
			(-1.890)
Mean Ln (Portfolio)	-0.005***	-0.004***	-0.004***
	(-15.420)	(-12.130)	(-11.960)
Mean N. Companies	0.004***	0.005***	0.004***
	(9.090)	(9.570)	(8.820)
Constant	-0.384***	0.280***	-0.367***
	(-26.380)	(7.020)	(-19.980)
N	40,384	40,384	40,384
Adj. R2	1.83%	2.89%	1.89%

Table Appendix A1. Portfolio Concentration

Table Appendix A1 provides an example as to how portfolio concentration is measured for one investor in one calendar month. *Concentration* is measured for each investor on the OSE for all calendar months in the sample. Column 1 lists the companies trading on the exchange. Column 2 reports the company weights in the example market value-weighted portfolio. Column 3 presents the company weights in the example investor portfolio. Column 4 lists the absolute difference between the investor weights and the market weights in each company. *Concentration* is calculated as half of the cumulated absolute difference between the investor weights and the market value weights (Choi et al., 2017).

1	2	3	4 (2-3)
Company	**Company Weight in Market Portfolio**	**Company Weight in Investor Portfolio**	**Absolute Difference**
A	0.1	0	0.1
B	0.3	0	0.3
C	0.2	0.8	0.6
D	0.2	0.1	0.1
E	0.2	0.1	0.1
Total	1.00	1.00	1.20
Concentration			0.6

Table Appendix A2. Variable Description

Close	The binary variable that takes a value of one (and zero otherwise) for investors who are regarded as high learning as they are geographically and/or culturally close to Norway based on the Hofstede six dimensions of cultural closeness (Denmark, Finland, Iceland, Sweden, the Faroe Islands, and the Netherlands) (Hofstede, 2003, 2018, Hofstede and Hofstede, 2004).
Concentration	The absolute total difference in the investor portfolio weights from the OSE market portfolio value weights divided by two (Choi et al., 2017). See Appendix Table A1 for a detailed description as to how *Concentration* is measured.
HML	High Minus Low is the average return on the value portfolio minus the average return on the growth portfolio (Fama and French, 1993; Ødegård, 2017).
Information ratio	Calculated as the Average (*RP-RM*)/Standard deviation (*RP-RM*).
Institutional	A binary variable that takes a value of one for institutional investors and zero for retail investors.
Mean Concentration	The average *Concentration* by each unique investor ID.
Mean Country Concentration	The average *Concentration* for all investor-month observations by each country.
Mean Country N. Companies	The average *N. Companies* for all investor-month observations by each country.
Mean Country Portfolio	The average *Portfolio* for all investor-month observations by each country.
Mean Country Return	The average *Return* for all investor-month observations by each country.
Mean N. Companies	The average *N. Companies* by each unique investor ID.
Mean Portfolio	The average *Portfolio* by each unique investor ID.
MOM	Momentum. The difference in return on winners and losers (Carhart, 1997; Ødegård, 2017).
N. Companies	The number of unique companies in the investor monthly portfolio.
Portfolio	The investor portfolio value calculated as the number of shares held times the share price.
Return	(RP-RF) is the monthly value-weighted investor portfolio return in excess of the risk-free rate of return.
RM	The unadjusted monthly value-weighted market portfolio return (Ødegård, 2017).
RM-RF	The value-weighted market return in excess of the risk-free rate of return (Ødegård, 2017).
RP	The unadjusted monthly value-weighted investor portfolio return.
SMB	Small Minus Big is the average return on the small stock portfolio minus the average return on the big stock portfolio (Fama and French, 1993; Ødegård, 2017).