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Can Norwegian multi asset-class funds time the market?

An empirical study

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Abstract

In this master thesis, we examine if Norwegian multi asset-class mutual funds (kombinasjonsfond) have the ability to time the market. Market timing skill is the ability to make successful bets on the future returns of an asset class. Norwegian multi asset-class funds have not been the subject for much research, and it is not clear if the market timing activities really adds value to the product. The market timing of multi asset-class mutual funds is particularly interesting, since they can invest in, and therefore time, multiple asset classes.

Our extensive dataset consists of monthly holdings and returns data for 22 funds over 8 years. We use four returns based models; we extend a Treynor & Mazuy model and a Henriksson & Merton model in order to search for timing ability in multiple asset classes. In addition, we incorporate more risk-factors into these models. Then, we use a method developed by Clare et al. that measure the relationship between changes in portfolio holdings in one asset class and subsequent asset class returns. In addition, we present a case study of timing performance during the financial crisis. We interview multi asset-class fund managers to shed light on industry practice.

Our results using the Treynor & Mazuy and Henriksson & Merton models show that a few funds seem to have market timing skill. Some of these few funds also seem to have market timing ability according to the holding based methods. The case study shows how funds on average increased their holdings of Norwegian equity at attractive levels after the financial crisis. We find that the portion of funds with timing skill in our study is higher than in most previous research from other markets. However, the most important finding is that regardless of method, the majority of funds in the sample do not have the ability to time the market.

Acknowledgements

We chose to write about asset management because of our long-time interest in the financial markets. The work has been both interesting and challenging.

We would like to thank our supervisor Thore Johnsen for his valuable contributions to our thesis. Also, we would like to thank Folketrygdfondet for helping us with the use of their benchmarks.

In particular, we have enjoyed interviewing fund managers, who enthusiastically shared knowledge about their industry with us. Therefore, we would like to express our gratitude to them.

Martin & Sigurd

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1. Introduction

1.1 Background information

Multi asset-class mutual funds are funds that invest in multiple asset classes. They have become an increasingly popular investment in Norway; as Figure 1 shows, the market has experienced rapid growth in assets under management over the recent years. Today, Norwegian multi asset-class mutual funds manage 66,6 billion NOK for almost 180 thousand customers, and thus, the fund category makes up a significant portion of total investment in mutual funds in Norway. Despite the growth, little research has been devoted to this fund category.

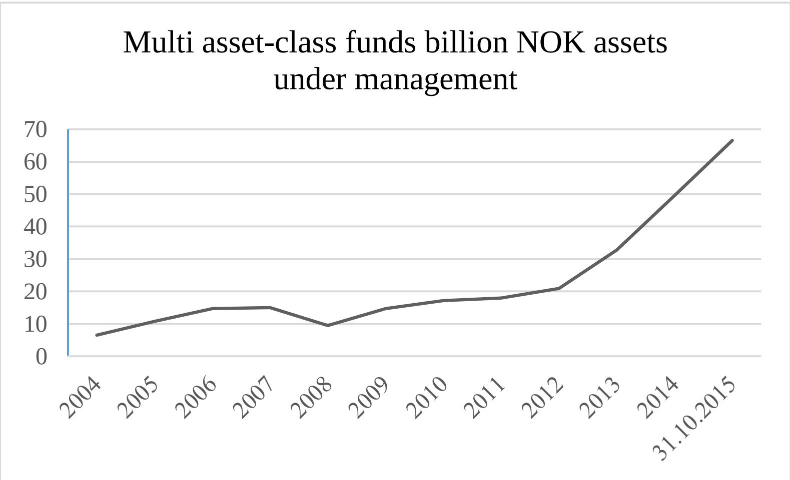


Figure 1: AUM Norwegian multi asset-class funds 2004-2015

The multi asset-class funds are usually actively managed regarding security selection, and attempt to time the market through tactical asset allocation. The management fee is often higher than if the investor were to buy a similar mix of actively managed equity funds and bond funds themselves. This means that in effect, investors are paying the managers to rebalance, and to make good decisions regarding the timing of the different asset classes. It is especially interesting to study the market timing of multi asset-class funds since they have to time several asset classes. Therefore, we would like to investigate if the market timing by these funds are successful.

1.2 Research question

In this paper, we study whether Norwegian multi asset-class mutual funds have market timing ability. We formulate our research question to be:

Are Norwegian multi asset-class funds able to time the market?

1.3 Structure of the paper

This first chapter **(1)** has provided a brief overview, and clarified the research question. In the second chapter **(2)** we will provide some background information about the Norwegian mutual fund industry. Then, we are going to review some of the most influential literature within the area of measuring market timing ability **(3)**. In the following chapter **(4)**, we are going to share some insights from managers we have spoken to in the Norwegian mutual fund industry. In addition to using the knowledge from previous studies, we allow the insights from these practitioners to influence the methods we develop in our methodology chapter **(5)**. We will present a returns based and a holding based method for measuring timing ability, taking several time horizons into account. After that, we will present our data **(6)**, and then our analysis including our findings **(7)**. In addition to the quantitative analysis, we present a case study of the financial crises, before we offer our conclusion **(8)**.

2. The Mutual Fund industry in Norway

A mutual fund is a collective investment in which many investors come together to place their investments in the securities market. The fund is a separate legal entity owned by the investors, and a management company with concession manages the assets in the fund. Mutual funds are organized as open-end funds, which means that investors can buy and sell fund shares at net asset value.

In Norway, the total amount of assets under management (AUM) by mutual funds for Norwegian customers have increased from 143,3 billion NOK in 2003 to 728,5 billion NOK in 2014. This corresponds to an average growth of 16% annually.

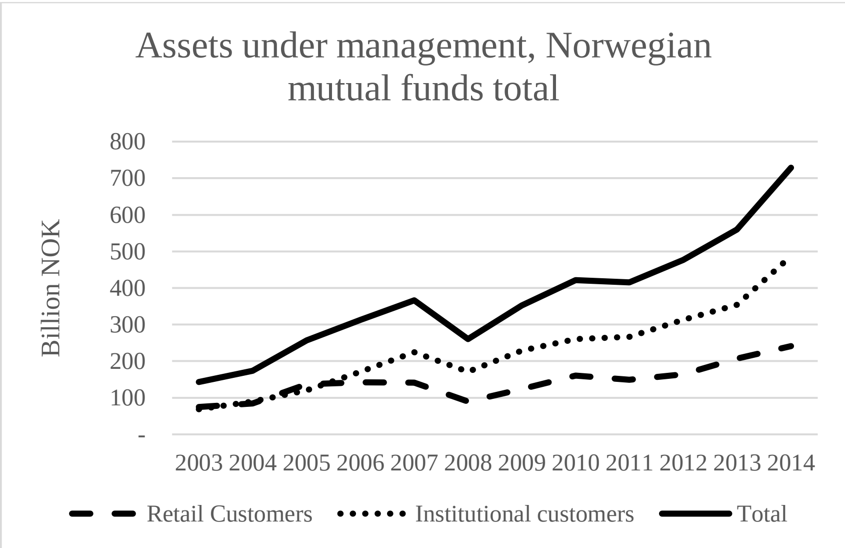


Figure 2: Norwegian mutual funds AUM 2003-2014

As of October 2015, there are 919 billion in assets under management by Norwegian asset management companies, spread over 1 677 656 customer relationships and 618 different mutual funds (Verdipapirfondenes Forening “Markedsstatistikk siste måned” 2015). The funds are managed by management companies, and among these some have relatively large market shares, measured by AUM. DNB Asset Management stands out as the leading management company, with more than a quarter of the total AUM.

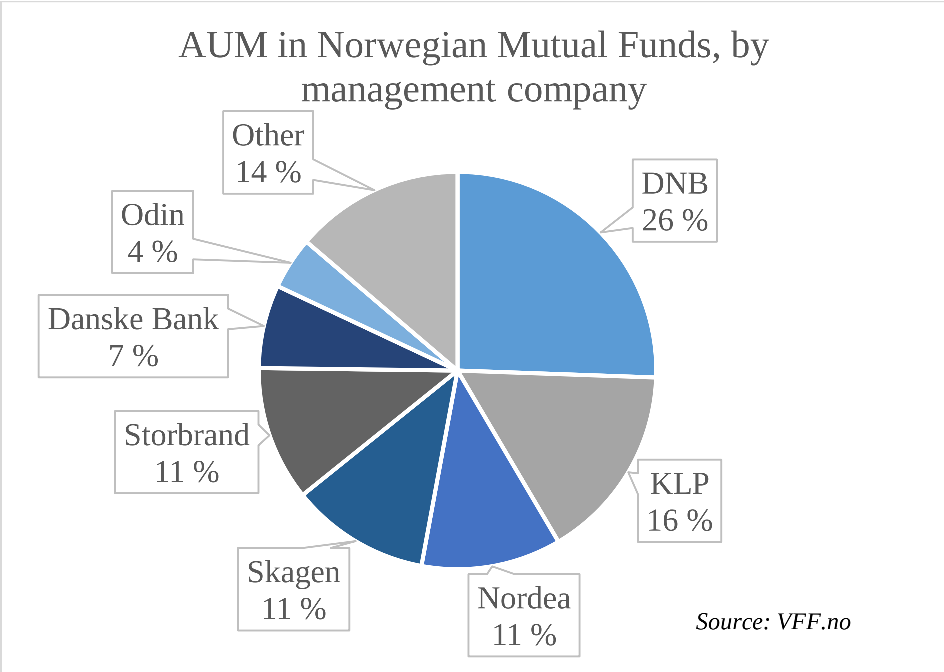
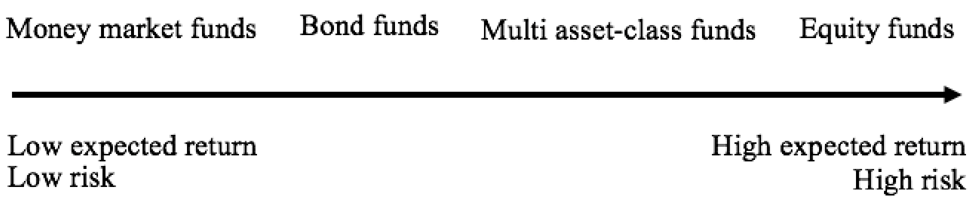


Figure 3: AUM October 2015 in Norwegian mutual funds, by management company.

2.1.1 Different kind of mutual funds



This overview of the different kind of mutual funds is based on Bodie, Kane and Marcus (2011, p. 125).

Money Market Funds: These funds invest in liquid short-term securities. These funds are considered to have low risk but low expected return, and therefore is mostly appropriate for short time horizons.

Bond Funds: These funds invest in corporate and government fixed-income securities. Some funds might only invest in corporate bonds and some might only invest in government bonds. Some funds focus on the so-called high-yield bonds, which are bonds that have higher yield because they are considered riskier. Bond Funds are usually considered riskier than Money Market Funds and less risky than Equity Funds. Bond Funds could be appropriate for investors that want higher return then Money Market Funds, but do not have the capacity to bear the risks that the Equity markets have.

Index Funds: These funds attempt to match the performance of a benchmark index as close as possible. The popularity of index funds have been growing steadily in the recent years, perhaps because investors realize that passive management often outperforms active management (Døskeland, 2015), and perhaps also because of the low management fees.

Actively managed Equity Funds: these are funds that primarily invest in stocks, and attempt to outperform their benchmark by superior security selection and/or good tactical allocation. Some equity funds that specialize in an industry, for instance healthcare, are called sector funds, and are appropriate if the investor wants an exposure to a specific sector. Equity funds that specialize in a geographic region, for instance India or Africa, are called regional funds. These funds could be appropriate if the investor needs geographical diversification or has a positive market view on a specific region. One problem with actively managed equity funds is that they often are more expensive, and often underperform the index after fees (Døskeland, 2015).

Multi asset-class Funds: These funds invest in both equity and fixed-income securities. The strategic allocation between stocks and bonds vary between funds, and more stocks are considered riskier. Some multi asset-class funds called life cycle funds vary their strategic allocation according to a predetermined schedule. Life cycle funds are designed with the purpose of having a smaller part of the portfolio in stocks the closer the investor get to spending the money, for instance in retirement. An advantage with multi asset-class funds is that the portfolio manager does the rebalancing between stocks and bonds, which means less work for the investor. Another advantage is that most multi asset-class funds are well diversified with regards to asset classes, and geography. Such diversification offers the opportunity for the investor to organize all her savings in one mutual fund. However, one possible problem with multi asset-class funds is that they attempt to do both security selection and tactical allocation, research show that this is hard to do (Døskeland, 2015). Multi asset-class funds are usually priced a bit higher than if one were to create a similar mix of equity and bond funds (Døskeland, 2014, p. 92).

Currently, as figure 4 show, multi asset-class funds account for 7% of the capital invested in Norwegian mutual funds. We see that the remaining assets under management are quite evenly distributed between Equity and bond funds.

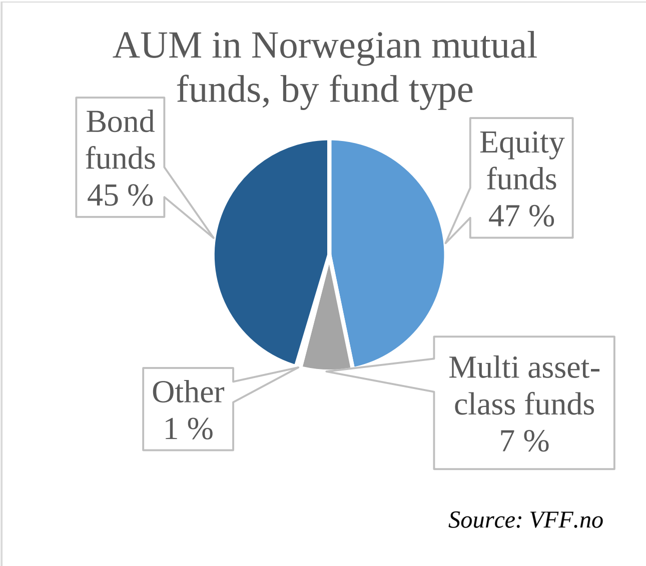


Figure 4: AUM in Norwegian mutual funds, by fund type

Figure 5 show that the commercial banks Nordea, Danske Bank and DNB have even larger market shares measured by AUM in the multi asset-class fund market than in the total mutual fund market.

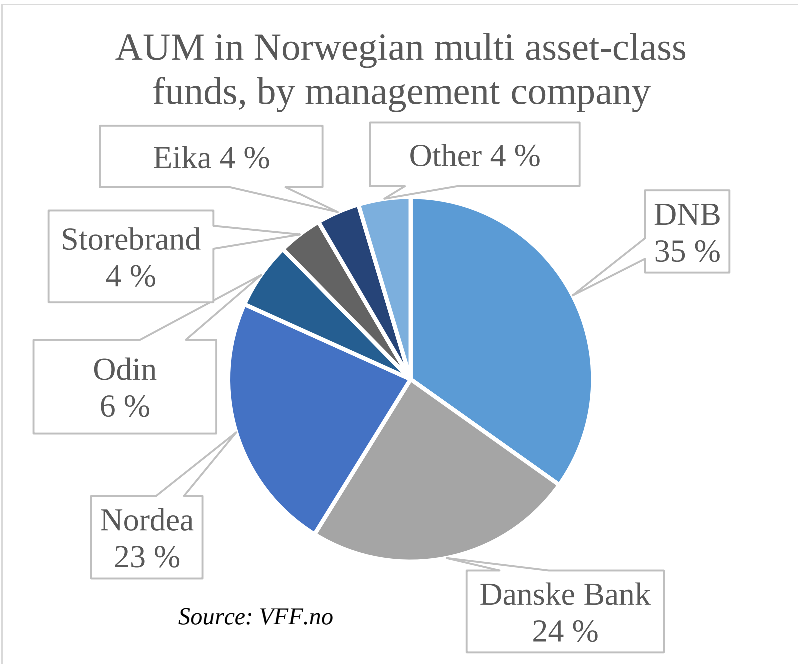


Figure 5: AUM in Norwegian multi asset-class mutual funds, by management company

3. Literature review: Measuring market timing ability

This chapter consists of four parts. First, we will go through an introduction on market timing, then the relevant methodology developed by previous researchers, then market efficiency and market timing, and lastly we review results from previous empirical studies.

3.1 Introduction to market timing

Multi asset-class funds differ from other mutual funds because they invest in multiple asset classes. An asset class is a category of assets that share the same characteristics, such as debt, equity, real estate etc. Many funds market themselves with an allocation between asset classes, called policy weights or strategic allocation. Actual portfolio holdings will differ from policy weights when the value of one asset class drift upwards or downwards. Typically, a portfolio holding both stocks and bonds would be characterized by the higher returns on stocks, causing the relative share of bonds to decrease over time. It is quite common amongst managers to rebalance according to some mechanic rule, e.g. triggered by time or by the portion of one asset class meeting some threshold. In addition, many managers attempt tactical asset allocation (TAA). A broad definition of TAA would be that the "tactical asset allocation contribution is defined as the difference between the strategic weight and realized allocation weights with the asset class timing component being the over or under-weighting of asset classes relative to the long run strategic target weights" (Clare, et al. 2015).

As figure 6 show, there are different approaches to managing a portfolio with multiple asset classes.

	Passive strategy	**Active strategy**
Use rebalancing rule	Rebalancing rule + No market timing attempts	Rebalancing rule + Attempts to time the market through TAA
No use of rebalancing rule	Buy and hold strategy. The portfolio drifts freely. No market timing attempts	Attempts to time the market through TAA

Figure 6: Multi asset-class management styles

Strategies that involves TAA are the most active forms of market timing. If the manager is able to predict the relative future performance between asset classes, and allocate accordingly, then the fund can generate superior returns for the investors. Even though the passive strategy with rebalancing does not try to time the markets actively, it could produce returns that are similar to those of a successful market timer. For example, this could happen when a fund is being forced to buy stocks by the rebalancing rule after a big drop in equity prices, and then hold these stocks into a subsequent market rally.

Now, we will expand on TAA as a market timing tool. Market timing, in its simplest form, involves shifting funds between a risky portfolio and a safe asset, depending on whether the risky asset is expected to outperform the safe asset (Bodie, Kane and Marcus 2014, p. 855).

The savvy investment manager David Swensen (2009) writes that market timers hope to underweight prospectively poorly performing asset classes and overweight prospectively strongly performing asset classes to enhance portfolio returns. We can easily establish that Swensen is no advocate for market timing activities. He states that “Because cash represents a poor asset class for investors with long time horizons, market timing strategies employing cash pose particularly great dangers to endowment assets” (Swensen 2009, p. 66), and thereby he is addressing how a market timer exposes himself to the risk of irreparable losses if he holds cash during a market upswing. It should be noted that Swensen’s warning does not have the same impact for multi asset-class funds, because they often allocate between asset classes with less difference in expected returns. Further, Swensen says that “market timing defined as short terms bets against long term policy targets, requires being right in the short run about factors that are impossible to predict in the short run" (2009, p. 64). Regardless of the viability of the practice, it is clear that successful market timing requires successful market predictions. Swensen, for his part, is a believer in that most markets price most assets with reasonable efficiency most of the time. We will return to the topic of market efficiency and market timing later in the chapter.

Even tough timing the market is difficult, the rewards could be great. Bodie, Kane and Marcus (2014, p. 857) illustrate the potential returns from market timing by calculating the returns of three portfolios; one holding a risk-free asset, one holding the S&P500 equity index, and one holding either the risk free asset or the equity index depending on which of them offering the highest return in any given one-year period. In other words, the latter portfolio is a perfect market timer. For the 86-year period 1926-2012, the risk-free portfolio would have yielded 20 times the invested funds. Holding the S&P500 would have given you 2 652 times your money back, while being a perfect market timer over the period would have given the investor a return of 352 796 times her initial investment. The massive difference is largely a result of the long compounding period, but it proves the point. If market timing is possible, it could be incredibly profitable.

3.2 Methodology in previous market timing research

We now explore the methods that previous research has used to detect timing ability in mutual funds.

3.2.1 Returns-based methods

The first attempts to measure the mutual fund managers timing ability assumes that asset returns can be described by the Capital Asset Pricing Model (CAPM). In short, if all investors are mean variance investors and have the same expectations of financial assets return, and covariance, then in equilibrium the return on an asset is a linear function of the assets beta with the market (Ang 2014, p. 198). For more on mean-variance investing see “Portfolio selection” by Markowitz (1952). For more on CAPM see Sharpe (1964), Lintner (1965) or Mossin (1966).

Treynor and Mazuy (1966) suggests that if some investors are able to time the market, then they will increase their systematic risk when the market return is high and reduce their systematic risk when the market return is low. To measure this timing ability they add a quadratic term to the standard CAPM model. The advantage of this model and return-based measures in general, is that we only need the funds’ returns; this makes the Treynor and Mazuy (TM) model easy to use.

Another intuitive return-based model is the Henriksson and Merton (1981) model (HM). The Henriksson and Merton model assumes that the manager only forecast if the market will beat the risk free asset of not, and then adjust the portfolio beta accordingly. To measure this Henriksson and Merton add a max function to the standard CAPM model. The max function takes on a value equal to the difference between risk free rate and the market return if this is positive, else it is zero.

The disadvantage with these models are that they assume that securities returns can be described by CAPM. It is well known that CAPM does not hold (Ang 2014, p. 197). In a CAPM world, the only risk factor is the market portfolio. A lot of research have been devoted to finding other risk factors. The risk factors size (market cap) and book-to-market ratio are suggested to influence asset prices (Banz, 1981; Rosenberg, Reid, and Lanstein, 1985; Fama and French, 1992, 1993, 1996) and a one-year momentum factor (Jagadeesh and Titman, 1993). The factors market, size and book-to-market are often referred to as the Fama–French three-factor model. Cakici (2015) finds that the book-to-market ratio factor is statistically significant in explaining the returns in a global stock portfolio but that the size factor is not statistically significant. Næs, Skjeltorp and Ødegaard (2008) find opposite results in the Norwegian equity markets; at Oslo Børs, size is a relevant risk factor, but book-to-market is not. Volkman (1999) and Goetzman, Ingersoll and Ivkovic (1999) extends the TM and HM models by adding these risk factors. Fama and French (1993) find that the risk factors term and credit are relevant for explaining bond returns. Comer (2006) extends the TM model by adding both equity risk factors and bond risk factors. These types of models with market return and other risk factors will be referred to as multi-factor asset pricing models.

Ferson and Schadt (1996) attempts to improve upon the standard TM and HM by incorporating public information that is known to predict market returns in the model, i.e. that expected market return is to some extent predictable by economic variables. The advantage of this model is that one can separate the market timing that comes from public information and find out which managers can time the market based on private information (Ferson and Schadt, 1996).

Jiang (2003) points out that the HM and TM methods fail to distinguish between the manager’s information advantage and the mangers response to that information. Therefore, Jiang proposes a non-parametric approach to measuring fund managers timing ability. In short, the non-parametric method measures the probability that the fund returns have a convex relation with the market, in excess of a concave relation. Put differently, the method measures how often the fund manager correctly predicts the market movement. For the investors, it is beneficial to separate between the manager’s information advantage and her response to this, because they can decide for themselves how much to invest in the fund (Jiang, 2003).

3.2.2 Known issues with return based methods

If the fund holds options and/or stocks with option-like features, a concave or convex relationship between portfolio returns and market returns can exist even if this is not due to timing per se (Jagannathan and Korajczyk, 1986). Bollen and Busse (2001) show that sampling frequency matter for measuring timing skill. Returns-based methods might fail to detect timing skills if the fund managers makes timing decisions more frequently than the data is sampled. They also argue that regressions might be miss-specified, because funds’ exposure to the market coincide with low volatility. If so, the standard correction for heteroscedasticity and autocorrelation might not correct these violations of the regression assumptions. Another problem is that funds tend to receive large inflows from investors when market returns are high, and if this increases the funds cash position it could cause the timing coefficient to be negatively biased (Edelen, 1999).

3.2.3 Holding based methods

These methods attempt to measure timing skill by using portfolio holdings as data. Jiang, Yao and Yu (2007) estimate the portfolios beta as a weighted average of betas from the portfolio holdings. Then they regress the portfolio beta on the next period market return. If the regression coefficient to the next period market return is significant, it indicates that the manager increases the exposure to the market when the market return is high. This method is more robust to the artificial timing effect of options or other assets with option-like features in the portfolio (Jiang, Yao and Yu, 2007). It is also more robust to managers trading more often than sampling frequency of returns.

Clare, et al. (2015) develops a holdings based method that is more suited to multi asset-class funds. They use the change in holdings of one asset class as the dependent variable and the asset class return of the next period as the independent variable. If this regression results in a statistically significant positive coefficient, it indicates that the manager is able to time exposure to that asset classes.

3.3 Efficient market hypothesis and timing models

The efficient market hypothesis states that market prices reflect all information, and thus it is not possible to achieve abnormal risk adjusted returns. According to Fama (1970), there are three forms of market efficiency: Weak form, semi-strong and strong form. If the market is efficient on weak form, then market prices reflect all past market data, like prices and volume. Semi-strong form of efficiency means that market prices also reflect all public information, like the quality of products and earnings. Strong form market efficiency implies that market prices also reflect all private information, for example, information such as not yet announced merger plans.

The finance literature describes several economic variables that are known to predict broad market return and risk for stocks and bonds (Ferson and Schadt, 1996). Fama and French (1988) showed that returns on the broad stock market tends to be higher when dividends yields are high. Campbell and Shiller (1988) found that earnings yield can predict broad market returns. Shiller earnings yield is intuitively consistent with Gordon's formula; high yields imply low prices, because cash flows are being discounted at high expected returns (Ang 2014, p. 263). Keim and Stambough (1986) found that the spread between yields on high and low-grade corporate bonds can predict broad market returns. That broad market returns are predictable with public information should not be interpreted as a violation of semi-strong market efficiency, but rather that risk premiums vary, and can be predicted by variables such as those indicated above (Bodie, Kane, and Marcus 2014, p. 366). When future returns are expected to be high, the investor is rewarded with a higher premium for taking on risk. Ang (2014, p. 259) explains that even though risk premiums are predictable by some variables, the amount of predictability is small; regressions made to predict market returns generally have an R2 lower than 5%.

The predictability of returns means that if one were to discover market timing ability using an unconditional timing model, it does not violate semi-strong market efficiency. Rather, it could reflect that the manager adjusts market exposure according to variations in risk premiums, and thus we cannot conclude with abnormal risk adjusted performance. If one were to use a conditional timing model that incorporate public information, like the model used by Ferson and Schadt (1996), then positive results could indicate either some information privilege or less efficient markets. Since Ang claims 95% of movements in markets are unpredictable, significant timing ability seem to imply the mentioned information privilege.

3.4 Review of empirical studies

3.4.1 TM and HM measures

In their original 1966 paper, Treynor and Mazuy are studying a dataset consisting of 57 funds using their TM method. They find that only one of the 57 funds has a significant timing coefficient, which makes Treynor and Mazuy question if the ability to outguess the market exists at all. Lonkani, Satjawathee and Jegasothy (2013) report similar findings in their study using TM and HM on 107 Thai funds with data from 1992 to 2004. Only two and one funds have positive timing skills. Skrinjaric (2013) employ the TM and HM frameworks on a sample consisting of 10 Croat funds, and reveals no positive timing ability.

Overall, the majority of studies employing the TM and HM models show that one cannot prove that fund managers on average have timing ability. But there are exceptions, however, like Low's (2012) study of monthly data from 67 funds located in Malaysia, where he finds that managers on average have positive timing ability using HM.

3.4.2 TM & HM measures with multi-factor asset pricing models

Some empirical studies with TM and HM multifactor asset pricing models has been conducted. A study of market timing by Volkman (1999) uses an expanded version of TM on data from 332 funds in the period 1980-1990, and finds that funds on average have negative timing ability. 45,5% of the funds have negative and significant timing ability, and 11,4% have positive and significant timing ability. Volkman find negative correlation between the ability to select undervalued securities and timing ability, and therefore suggests that when managers focus on one source of return, it could be at the expense of the other. Goetzman, Ingersoll and Ivkovic (1999) also employs a multifactor version of the original HM measure. They argue that the original version of the HM model used on monthly data is not suited to capture the timing skills of daily timers. Therefore, they develop a method in which the cumulated value of daily puts on the market is used to estimate the value of a managers timing skill. Their method turns out to have greater power in recognizing timing skills on generated return series, but when used on data from 558 funds in the period 1988-1998 it merely confirms the conclusions of previous studies, showing very little presence of timing ability among mutual fund managers.

3.4.3 Conditional TM & HM

Some models employ known predictors of broad market returns as variables. When comparing conditional versions to unconditional versions of the TM and HM models on 67 funds with data spanning from 1968 to 1990, Ferson and Schadt (1996) find that the unconditional models report a high frequency of negative timing skill. Ferson and Schadt states that it seems unlikely that a large portion of managers consistently outperforming the market negatively. Such managers would probably not stay in business for long, and hence, Ferson and Schadt do not believe their own estimates are reliable. When they introduce variables that are known to predict broad market returns, most of this negative timing ability disappear. Ferson and Schadt also find that a group of funds called “special funds” has strong positive alphas, and significant negative timing coefficients. While it is not suggested specifically, this is consistent with the later findings of Volkman (1999) that success in selectivity might come at the expense of timing.

Becker et al. (1999) builds on the previous works of Ferson and Schadt (1996). They start of by testing the unconditional version of TM, and find that mutual funds on average have a small but significant negative timing ability. When the public information variables are incorporated into the model, the negative timing ability is no longer present.

The findings of Chen et al. (2013) are also in accordance with previous studies. When using the traditional HM and TM measures on their dataset of 77 Taiwanese funds between 2005 and 2009, the average mutual fund in their sample exhibits a negative timing ability. Just as Becker et al. (1999) and Ferson and Schadt (1996), their use of the conditional TM and HM models removes some of the negative timing ability. Chen et al. highlight the interesting fact that results from the market timing tests are significantly different depending on the use of monthly or weekly data.

3.4.4 Non-parametric method

Jiang (2003) employs a non-parametric method in order to test his large sample of 1927 funds for timing ability. He finds that overall, there is no evidence that managers possess superior market timing abilities. Thus, the findings are similar to those from studies where TM are used, as the funds on average exhibit negative timing ability. Similarly to the conditional HM and TM models, a non-parametric model that is conditional on known market predictors removes much of the negative timing ability from the result. Within the sample, the differences between the best and the worst performers are small and often insignificant, and Jiang is not able to relate them to fund characteristics. Hence, he argues, it is difficult for the investor to pick the better market timer.

Studying around 800 UK funds, Cuthbertson, Nietzsche and O'Sullivan (2010) find that using the non-parametric approach, 1% of their sample has significant positive timing ability, while 19% are significant negative market timers. They also add public information to the model, and find that there is no evidence of timing based upon private information.

Alvarez et al. (2012) have also used the non-parametric method on 109 Spanish funds. Their studies show no indications of market timing ability.

3.4.5 Holding based approach

Jiang, Yao and Yu (2007) studies market timing ability with portfolio holdings data. First, they investigate timing ability using TM and HM, and they find that timing ability on average is negative and statistically insignificant. Then they move on to use different varieties of holding-based approaches, and interestingly they find clear evidence of successful market timing on average among actively managed US mutual funds. They also report that a relatively large proportion of the funds have strong timing skills, which adds support to the existence of market timers. In addition, Jiang, Yao and Yu point out that mutual funds adjust their portfolios in response to both variables that are known to predict market returns, and private information, and that funds make changes in industry allocation in response to changes in market predicting variables.

3.4.6 The case of multi asset-class funds

Most of the research done on funds' timing ability does not separate between multi asset-class funds and other mutual funds. Therefore, we would like to present some research specifically on the timing ability among multi asset-class fund managers. They differ from previously presented research by emphasizing how managers have to time their allocation in multiple asset classes.

Comer (2006) uses a multi-factor TM model with a stock and bond benchmark on two different samples of multi asset-class funds. In the first sample, with 56 funds from 1981 until 1991, he finds little evidence for market timing. In the second sample, with 58 funds in the time period

1992-2000 he finds timing ability, 26% of the funds have a positive and significant timing coefficient.

Andonov, Bauer & Cremers (2012) claim that the market timing activities of pension funds contribute with a excess return, but they carefully state that this is not due to conscious tactical allocation. Instead, they attribute this excess return to a rebalancing rule that allow some deviation from policy weights, as opposed to rebalancing immediately.

Clare et al. (2015) are addressing the issue of multi-asset class funds in their study of monthly data on both Return and holdings from 617 funds in the US, UK and Canada. Using an extended TM returns model, they find that among multi asset class funds in the US, only 1,7% are able to time equity, while 17,5% and 4,3% are able to time corporate bonds and treasury bonds, respectively. Similarly, 9% of UK funds have significant positive timing coefficients on corporate bonds, but none has timing ability on equities. More specifically, according to Clare et al. the TM model show that 16,3% of UK multi asset class mutual funds have a negative and significant market timing ability. Overall the TM measure employed on Canadian funds indicate no evidence of market timing ability in any asset class. But Clare et al. modifies the impression a bit by using holding based measures, and finding that in all of the three countries more funds have significant timing ability. Still, they emphasize that by either measure, the ability to time asset classes is rare.

We conclude that the empirical research in the field of market timing by mutual fund managers is quite clear in its findings; very few are able to time the market.

4. The Norwegian industry practice

4.1.1 The practitioners

We have talked to several practitioners in the Norwegian mutual fund industry in order to get a better understanding of industry practice, especially concerning their take on market timing. The practitioners we have been in touch with are involved in the management of a vast majority of the assets under management in our sample. They represent both commercial- and investment banks, and combined their funds have more than 90 000 customers.

4.1.2 Multi asset-class fund customers

Through our conversations with some of the managers, it appears that multi asset-class funds are mostly a product intended for retail customers. The predetermined asset allocation is not as attractive to institutional investors; they usually work out their own asset allocation in cooperation with advisors. One manager told us that they primarily compose asset allocations for some large institutional customers, and secondarily apply this asset allocation to the multi asset-class fund.

4.1.3 The role of tactical asset allocation

The market for multi asset-class funds is growing, and market-timing activity is clearly a component of the management service. One practitioner explicitly told us that for their fund, the allocation between asset classes is dynamic, and is used actively with the purpose to increase the risk-adjusted return of the fund. Another manager told us that they do not believe they are able to outperform the market in the short run. However, they believed that the economy is cyclical, and that successful portfolio allocations determined by the business cycle should generate excess returns. The manager also said that the rebalancing of the portfolio is a risk management tool, in order to counter the change in risk in a portfolio due to it drifting away from its policy weights over time. To support tactical asset allocation decisions, the practitioners mention considerations about the general valuation and risk levels as the key elements. In addition, macroeconomic indicators are agreeably important, and the importance of central bank decisions is emphasized.

4.1.4 Time horizon for tactical allocations

The time horizon for tactical allocation differs between the practitioners. One manager say they consider changes in the tactical weights monthly, and that these changes mean to apply for a time span of two months. Another manager says the frequency of changes to their tactical allocations might be once every two months, or even less if the market developments are consistent with their expectations, while emphasizing that they do not believe in timing the market on a weekly or monthly basis. A third manager says they make tactical allocations with expected payoffs in 6-12 months. Generally, the managers express that changing market conditions call for more frequent reconsiderations of allocations.

4.1.5 Internal performance review

The managers told us they use attribution analysis to separate between the stock selection activities and tactical asset allocation.

4.1.6 Benchmarks

The benchmark indices they use in their internal performance measurement may differ from what is publicly available. For example, there is no proper Norwegian private bonds index, which forces many managers to quote a government bond index as their reference externally, even though it might not reflect the private bond risk premiums. One manager states that they have indexes for measurement internally, but due to the complexity of these benchmarks, they do not publish them.

4.1.7 Deviation from policy weights

Regarding how much they can deviate from the policy weights, the managers have varying degrees of freedom. One manager told us that they have a minimum requirement to tracking error of the portfolio, and a maximum requirement in terms of how much they could deviate from the long-term policy weights. This individual pointed out that a manager should provide value to customers by executing high-quality active management, and still keep the allocations close enough to the policy weights so that the benchmark provides meaningful information about the product. Another manager described how they did not have specific formal requirements, but tried to keep deviations from the policy weights to under 10-15 percentage points. A third manager described how their fund might allocate 50 percent to equity if they consider the market expensive, and how this could change to around 90 percent of the portfolio if equities were more attractively priced.

4.1.8 View on multi asset-class funds as investment product

The managers shared their thoughts about multi asset-class funds as investment vehicle for Norwegian retail investors. They agreed that multi asset-class funds makes sense as a way of investing, because of the volatility protection it offers investors. Retail investors tend to behave pro-cyclical, that is buying high and selling low. Due to this unfortunate strategy, the return to a retail investor is often much lower than the average fund return. Therefore, a product with less fluctuation might be able to provide a better return simply because the investors do not sell in panic if the market plummets. A second practitioner adds, though, that Norwegian retail investors often are over-invested in the housing market and thus in theory could withstand a higher equity share.

5. Methodology

We will use five different methods to answer the research question. Four of the methods require returns data and the fifth require holdings data. First, we will explain our returns based methods.

5.1 The Treynor & Mazuy returns based method

This model is a further extension of the model proposed by Clare et al. (2015), which extends the original TM model (Treynor and Mazuy 1966) by adding more asset classes. The methodology we explain in this section is similar to their approach. For our purpose, we will also determine asset class by the assets geographical origin. Our multi asset-class funds invest in different markets, so we account for this by using different versions of the model; we use one for funds that only invest in Norway, and one for funds that also invest outside Norway by adding additional benchmarks. For the funds that only invest in Norway, we exclude the international benchmark. For the funds that that invest globally, the international benchmarks are represented by our global indexes, and for the funds that only invest in the Nordic countries the international benchmark is represented by Nordic benchmarks excluding Norway.

First, we model the funds returns, where we allow exposure to different asset classes to vary with time.

$$Rp_t = \alpha_p + \theta_{1t}Rne_t + \theta_{2t}Rnb_t + \theta_{3t}Rie_t + \theta_{4t}Ricb_t + \varepsilon_{pt} \tag{1}$$

Rp_t is the excess fund return

α_p constant to account for stock picking

Rne_t excess return Norwegian equites benchmark

Rnb_t excess return on Norwegian bonds benchmark

Rie_t excess return on the international equites benchmark

$Ricb_t$ excess return on international corporate bond benchmark

ε_{pt} is an error term

Each theta coefficient in model 1 is assumed conditional upon the expected next period return in the different asset classes, as follows:

$$\theta_{1t} = \beta_1 + \beta_3 Rne_{t+1}$$

$$\theta_{2t} = \beta_2 + \beta_4 Rnb_{t+1}$$

$$\theta_{3t} = \beta_5 + \beta_7 Rie_{t+1}$$

$$\theta_{4t} = \beta_6 + \beta_8 Ricb_{t+1}$$

These equations recognize that managers might be able to time their exposure to the different markets, and adjust the betas accordingly.

Inserting forθ_{1t}, θ_{2t}, θ_{3t} and θ_{4t} results in:

Norwegian investment universe model

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \beta_3 Rne_t^2 + \beta_4 Rnb_t^2 + \varepsilon_{pt} \qquad (2)$$

International investment universe model

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \beta_3 Rne_t^2 + \beta_4 Rnb_t^2 + \beta_5 Rie_t + \beta_6 Ricb_t + \beta_7 Rie_t^2 + \beta_8 Rib_t^2 + \varepsilon_{pt} \qquad (3)$$

The positive (negative) statistically significant coefficients for the squared terms can be interpreted as positive (negative) timing ability in that asset class. Estimation of the coefficients is done for each fund individually by regression.

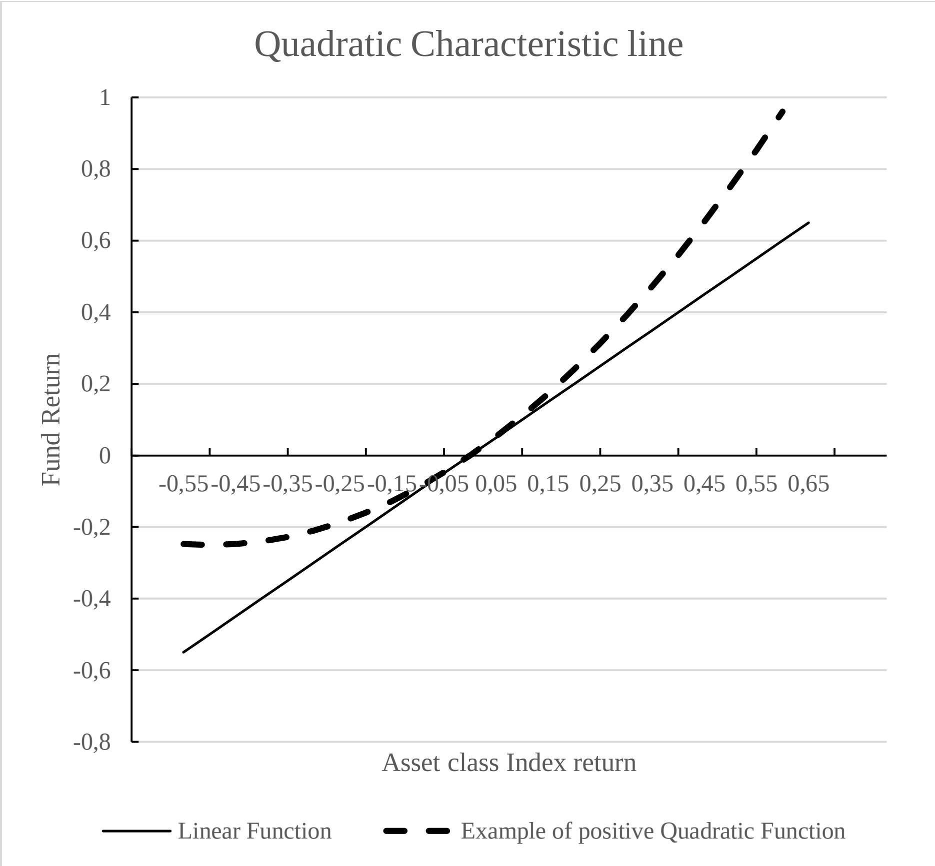


Figure 7: TM model with positive timing skill

Including all the benchmarks in one regression model will make the estimation of the betas somewhat harder because of collinearity between benchmarks. However, estimating one beta at the time is not an option, because of the omitted variable bias that would be likely to influence our estimates (Wooldridge 2014, p. 76-86).

The goal of our benchmarks is to represent the asset classes that our funds invest in. We think it is meaningful to separate between assets in Norway and internationally, because this allows our model to capture tactical allocation bets along the geographical dimension.

5.2 The Henriksson & Merton returns based method

We also extend the Henriksson Merton model to accommodate more asset classes in the same manner as with the TM model. The HM model differs by replacing the quadratic term with a max function. The max function takes the value of the index return in excess of the risk free return if this is positive, or zero if the excess return is negative. Practically, this means including a variable with only positive index returns and zero's in the regression.

Norwegian investment universe model

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \beta_3 Max(Rne_t, 0) + \beta_4 Max(Rnb_t, 0) + \varepsilon_{pt} \quad (4)$$

International investment universe model

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \beta_3 Max(Rne_t, 0) + \beta_4 Max(Rnb_t, 0) \quad (5)$$
$$+ \beta_5 Rie_t + \beta_6 Ricb_t + \beta_7 Max(Rie_t, 0) + \beta_8 Max(Ricb_t, 0) + \varepsilon_{pt}$$

For the funds that only invest in Norway, the international terms are excluded. For the funds that invest globally, the international benchmarks are represented by our global indexes, and for the funds that only invest in the Nordic countries the international benchmark is represented by the Nordic indexes excluding Norway.

Any positive (negative) and statistically significant coefficients for the max function variables can be interpreted as positive (negative) timing ability in that asset class. Estimation of the coefficients is done for each fund individually by regression.

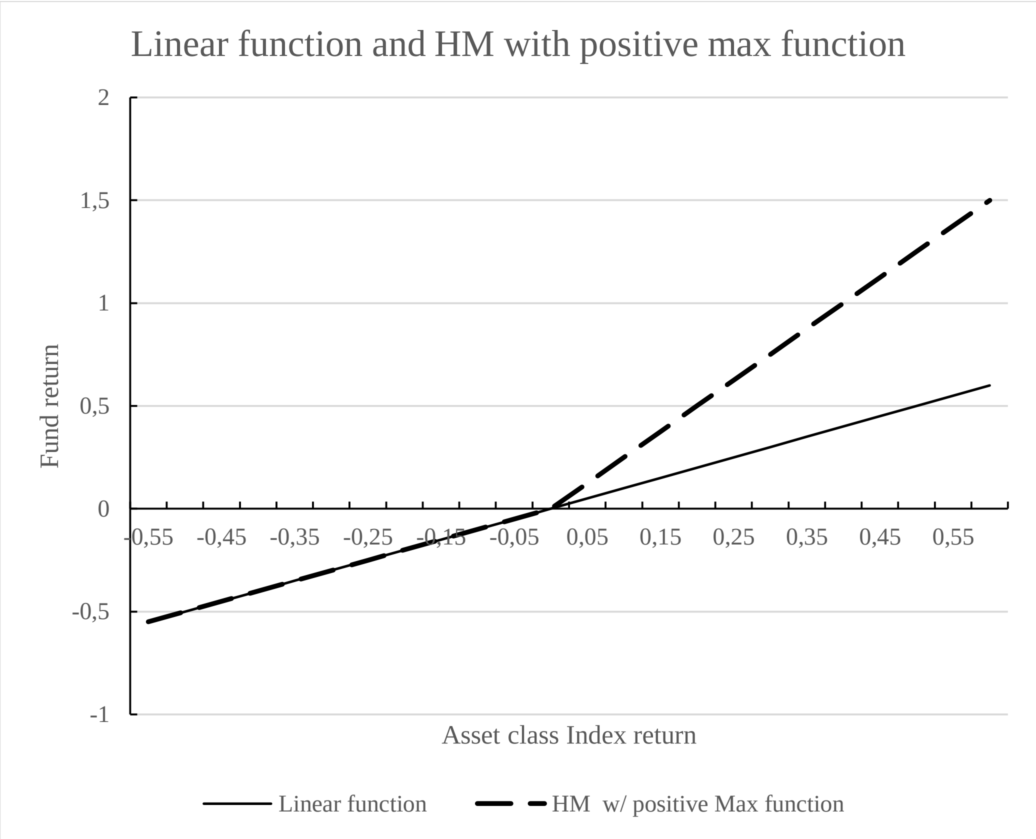


Figure 8: HM model with positive timing skill

Though interviews we learned that our data sampling frequency is higher than the fund managers' timing decision frequency. Therefore the problems regarding sampling frequency and timing frequency reported by Bollen and Busse (2001) should not prevent us from detecting timing ability. The managers also told us that their inflow does not alter their allocation, and therefore the problem suggested by Edelen (1999) with negatively biased coefficients due to involuntary large cash positions should not influence our results. We are not sure about the extent to witch the funds holds stocks with option like features, but we know there is very few options in the portfolios. For this reason, we believe that a convex or concave relationship between funds returns and benchmark returns should come from TAA, and not arise from options and option like stocks in the way Jagannathan and Korajczyk (1986) suggest.

5.3 TM and HM with more risk-factors

To better describe the multi asset-class funds return we expand the TM and HM model with the risk factors from the Fama–French three-factor model. The risk factors are SMB and HML. SMB is defined as return on a portfolio with a long postion in small cap stocks and a short position in large cap stocks, and HML is defined as return on a portfolio with a long position in stocks with high book-to-market ratio and a short position in stocks with low book-to-market ratio. High book-to-market ratio stocks are often referred to as value stocks and low book-to-market ratio stocks are often referred to as growth stocks. For the international funds, we will add these also add an international version of these risk factors, for the Nordic funds these are represented by Nordic risk-factors, and for the global funds, these will be represented by global risk-factors. Most of our funds also have a large portion of their portfolios in Norwegian bonds, therefore we also add a term-premium. The term premium is defined as return on long-term government debt minus return on short term government debt. We could have added more risk factors, but this would have made the models more complicated. The risk factors we choose to use are among the more popular in performance measurement. The portfolios one choses to calculate these risk-factors obviously has an effect on the risk premium of the factor. We will choose portfolios similar to previous research, more on this in the data chapter. We will refer to these models as multi-factor TM and HM.

Norwegian investment universe multi-factor TM model

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \beta_3 Rne_t^2 + \beta_4 Rnb_t^2 + \beta_5 SMBNOR_t + \beta_6 HMLNOR_t + \beta_7 TERMNOR_t + \varepsilon_{pt} \quad (6)$$

International investment universe multi-factor TM model

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \beta_3 Rne_t^2 + \beta_4 Rnb_t^2 + \beta_5 Rie_t + \beta_6 Ricb_t + \beta_7 Rie_t^2 + \beta_8 Ricb_t^2 + \beta_9 SMBNOR_t + \beta_{10} HMLNOR_t + \beta_{11} TERMNOR_t + \beta_{12} SMBINT_t + \beta_{13} HMLINT_t + \varepsilon_{pt} \quad (7)$$

Norwegian investment universe multi-factor HM model

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \beta_3 Max(Rne_t, 0) + \beta_4 Max(Rnb_t, 0) + \beta_5 SMBNOR_t + \beta_6 HMLNOR_t + \beta_7 TERMNOR_t + \varepsilon_{pt} \quad (8)$$

International investment universe multi-factor HM model

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \beta_3 Max(Rne_t, 0) + \beta_4 Max(Rnb_t, 0) + \beta_5 Rie_t + \beta_6 Ricb_t + \beta_7 Max(Rie_t, 0) + \beta_8 Max(Ricb_t, 0) + \beta_9 SMBNOR_t + \beta_{10} HMLNOR_t + \beta_{11} TERMNOR_t + \beta_{12} SMBINT_t + \beta_{13} HMLINT_t + \varepsilon_{pt} \quad (9)$$

$SMBNOR$ small cap premium for Norwegian equites

$HMLNOR$ value premium for Norwgian equites

$TERMNOR$ term premium for Norwegian bonds

$SMBINT$ small cap premium for international equites

$HMLINT$ value premium for international equites

Since we now have included even more variables, we will test if multicollinearity is a problem in these models by calculating a variance inflation factor (VIF) for each beta.

5.4 Holding based method

Our holding based method is similar to Clare et al. 2015.

Holdings based timing measure, model 10

$$\%\Delta AC_{j,t} = \alpha + \beta_j R_{j,t+z} + \varepsilon_{j,t} \tag{10}$$

The dependent variable is the change in asset class j holdings at time t, change is defined as holdings at time t minus holdings at the previous period time t-1. Holdings are measured as percentage of the total fund assets. $R_{j,t+z}$ is the excess return for the j asset class over the next z months. The asset class benchmark are the same as in the returns based methods. Our method differs from Clare et al. 2015, because it allows managers to time on different horizons. From interviews, we know that managers make tactical allocations with different time horizons, and therefore we account for this in our methods. We have chosen to use 1, 3, 6, 9 and 12 months. This should capture the managers' timing horizon well. Figure 9 below illustrates how the variables in model 10 relates to time. The takeaway from the figure is that the change in asset class variable, %ΔAC, is supposed to vary upon future returns.

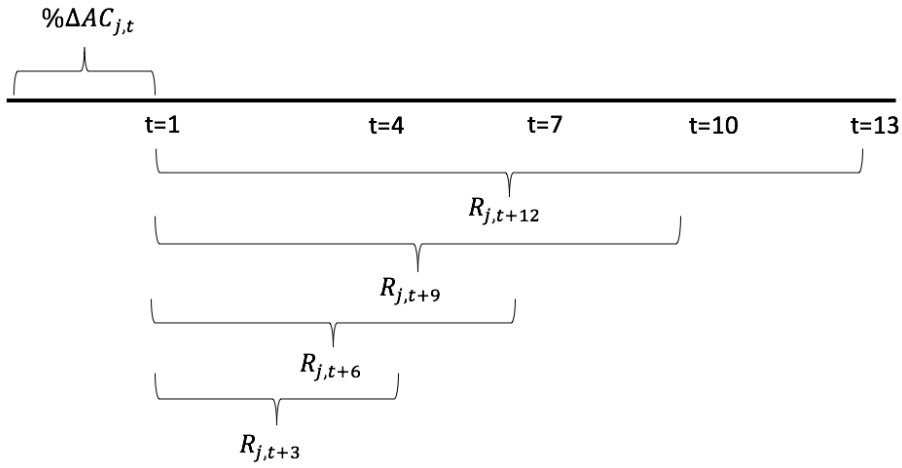


Figure 9: Holding model illustration

We want to estimate if the managers successfully predict and adapt to future returns. Estimation of β_j is done using regression. A positive β_j indicates that the fund increases its holdings in that asset class prior to positive excess return in that asset class and decrease before negative excess returns in that asset class. A negative β_j indicates that the holdings of that asset class decrease before a positive return, and that the holdings increase before a negative excess return. Therefore, a positive β_j indicates timing ability, while a negative β_j indicates unfavorable timing ability.

5.5 OLS regression and regression assumptions.

5.5.1 OLS estimation of regression coeficients

The following brief explanation of OLS and OLS assumptions is built on Wooldridge (2014) chapter 2, 3 and 10. The purpose of OLS is to explain how one variable varies with changes in other variables. All of our methods use OLS to estimate the betas, but we will use model 2 in this explanation. However, everything also applies to the HM, multi-factor and holdings based method. Model 2 was:

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \beta_3 Rne_t^2 + \beta_4 Rnb_t^2 + \varepsilon_{pt}$$

The coefficients α and the β's are estimated using Ordinary Least Squares. In short, the procedure results in the estimated coefficients α and the β's that minimize this expression:

$$\sum_{t=s}^{T} (Rp_t - \alpha_p - \beta_1 Rne_t - \beta_2 Rnb_t - \beta_3 Rne_t^2 - \beta_4 Rnb_t^2)^2$$

t is the observation dates that starts at s and ends at T (Wooldridge chapter 10).

We estimate the standard errors of the betas using the Huber-White sandwich estimators. Using the Huber-White sandwich estimators aim to improve the model in case of problems with the OLS assumptions, such as heteroscedasticity, minor problems about normality and observations that have large influence. This procedure do not change the point estimates of the betas. It changes the standard errors and therefore also the calculated t-statistics. Usually, results from the Huber-White sandwich estimation are very similar to OLS estimation of standard errors (UCLA "Regression with Stata" 2015).

T-statistics are calculated by dividing the betas by its standard error. The t-statistic is assumed to have a t-distribution. The t-distribution is similar to the normal distribution for large samples. With the t-distribution and t-stat, one can calculate the probability of getting that result or a more extreme result, given that the beta is zero. This is called a p-value. If the p-value is larger than 5%, one usually keeps the hypothesis that the true value of beta is zero. If it is smaller than 5%, one usually rejects the idea that the beta is zero and keep the estimated beta from the regression.

5.5.2 Assumptions OLS with time series data

For the estimated coefficients to be unbiased there are three requirements that need to be fulfilled. First, the fund excess returns as the dependent variable need to be explained by a linear combination of our independent variables, namely the different benchmarks excess returns and benchmark excess returns squared. Secondly, none of the independent variables can be constant or a perfect linear combination of the other. Third, the error term ε_{pt} has a zero expectation given the independent variables in all time periods. If these requirements are fulfilled the OLS estimated betas are unbiased.

Two further requirements need to be fulfilled for the standard error of the betas to be unbiased. Homoscedasticity is that the variance of the error term is the same for all time periods, conditional on the independent variables. In addition, the error terms in any two different time periods need to be uncorrelated, conditional upon the independent variables.

Furthermore, the errors terms need to be independently and identically distributed as normal for the t-statistics to have a t-distribution. The last requirement is the strongest and implies the previous three requirements. If this is not fulfilled the calculated p-values could be unreliable.

5.5.3 Durbin-Watson test for autocorrelation

To test for autocorrelation we use the Durbin-Watson statistic (Durbin and Watson, 1950).

$$DW = \frac{\sum_{t=2}^{n}(\varepsilon_t - \varepsilon_{t-1})^2}{\sum_{t=1}^{n}\varepsilon_t{}^2}$$

ε_t is the error term from the regressions. The null hypothesis is no autocorrelation. We use the Savin and White (1977) critical values. DWL and DWU are the critical values, they depend on the significance level, number of independent variables in the regression and number and observations.

Table 1: Durbin-Watson interpretations

DW test statistic	*Result*
0<DW<DWL	Positive autocorrelation
DWL<DW<DWU	Inconclusive
DWU<DW<4-DWU	No evidence of autocorrelation
4-DWU<DW<4-DL	Inconclusive
4-DL<DW<4	Negative autocorrelation

We will use DWL and 4-DWL as limits and 1% significance level. Not all our tests have the same number of observations or number and therefore the values from the Savin and White (1977) table will be different. We also have to round up or down to the closest number that is divisible with five, because this is the only ones that are included in the Savin and White (1977) table for large sample sizes. n = number of observations and k = number of independent variables in the regression, excluded the intercept term.

Table 2: Durbin-Watson critical values

Regression analysis	n	k	DWL	4-DWL
Returns based Norwegian	95	4	1,446	2,554
Returns based International	95	8	1,358	2,642
Returns based multi-factor Norwegian	95	7	1,381	2,619
Returns based multi-factor International	95	13	1,244	2,756
Holdings 1 and 3 months	95	1	1,510	2,490
Holding 6 and 9 months	90	1	1,496	2,504
Holdings 12 months	85	1	1,481	2,519

5.5.4 Whites test for homoscedasticity

The White test establishes whether the residual variance of a dependent variable in a regression model is constant, i.e. homoscedastic. The White test tries to find if the error term $\hat{u}^2$ is correlated with the explanatory variables (x_i), the squared terms of the explanatory variables (x_i^2), and cross products of the explanatory variables ($x_i x_j$) (Wooldridge 2014, p. 269). Here, the white test is exemplified with three explanatory variables:

$$\hat{u}^2 = \delta_0 + \delta_1 x_1 + \delta_2 x_2 + \delta_3 x_3 + \delta_4 x_1^2 + \delta_5 x_2^2 + \delta_6 x_3^2 + \delta_7 x_1 x_2 + \delta_8 x_1 x_3 + \delta_9 x_2 x_3 + \varepsilon$$

If the explanatory variables are uncorrelated with the error term, then the explanatory power of the regression above, $R^2_{\hat{u}^2}$, should be low. The White test reports an LM test statistic for that all δ_j are zero, except for the intercept. The test statistic follow a chi-squared distribution, and thus, one can calculate a P-value.

$$LM = n * R^2_{\hat{u}^2}$$

If the LM statistic corresponds to a P-value below some chosen significance level, then either heteroscedasticity or a specification error is present.

5.5.5 Shapiro–Wilk test for normality

To test if our residuals are normally distributed we use the Shapiro–Wilk test (Shapiro and Wilk 1965). The test statistic is:

$$W = \frac{\sum_{i=1}^{n} (a_i x_{(i)})^2}{\sum_{i=1}^{n} (x_i - \bar{x})^2}$$

$x_{(i)}$ is the i'th order statistic, $\bar{x}$ sample mean and a_i:

$$(a_1, \dots, a_{n)} = \frac{m^T V^{-1}}{(m^T V^{-1} V^{-1} m)^{0,5}}$$

Where $m = (m_1, \dots, m_n)^{T}$

$m_1, \dots, m_n$ are the expected values of the order statistic independent and identically distributed random variables sampled from the standard normal distribution. V is the covariance matrix of those order statistics. The null hypothesis is that W is normally distributed with 0 mean and 1 variance. If W has an extreme value, then we have to reject this and conclude that our residuals are not normal. With a 5% significance level and a two-sided test, the critical values are 1,96 and -1,96.

5.5.6 Variance inflation factor

$$VIF_j = \frac{1}{1 - R_j^2}$$

Where R_j^2 is the proportion of the independent variable j that can be explained by the other independent variables, in a regression on the other independent variables (Wooldridge, 2012). If VIF for a coefficient is above ten, then it is normal to conclude that multicollinearity is a problem for measuring that coefficient. The most important VIF are the ones related to the variable of interest, in our cause the timing coefficient, because those are the coefficients we are trying to estimate.

5.5.7 Sample selection and inference

Ideally, we would like our study to produce information about all, i.e. the population of, Norwegian multi asset-class mutual funds. That way, any statements we make that builds upon the results may apply to any Norwegian multi asset-class mutual fund. The easiest way to do this would be to include all funds in the sample. However, our data requirements may not allow us to do so. In order to do produce results that may apply to the population, we rely on our sample being representative. In essence, this implies that the average characteristics of our sample are the same as the average characteristics of the population.

6. Data

6.1 Sample selection

For multi asset-class funds, Verdipapirfondenes Forening (VFF) reports 64 billion in assets under management spread over 54 funds with 178 570 customer relationships. In order to measure market timing ability among Norwegian multi asset-class mutual funds, we obtain data on as many of these funds as possible, within a set of sample requirements.

We have defined our sample of multi asset-class funds using the following criteria:

- The funds have to be available to Norwegian retail investors
- The funds have to be defined as multi asset-class funds by either Morningstar (Category : Kombinasjonsfond, NOK), VFF (Category: Kombinasjonsfond) or Finansportalen (Category: Kombinasjonsfond)
- The funds must have a strategy where they invest in both equity and bonds, formally;
    - The funds have at least 10% of assets under management invested in equity at some point of time
    - The funds must have at least 10% of assets under management invested in bonds at some point of time
- The funds must have been operative, and have available returns data, since 30th of June 2007
- The funds should not be "life cycle" funds, with specific end years.

Imposing these restrictions result in a sample of 22 multi asset-class funds. VFF and Morningstar reports that the sample represents total assets under management of NOK 29 005 826 000, and as of September 2015 they maintain over 128 000 customer relationships.

For our sample of 22 funds, we obtain data on fund share Net Asset Value (NAV) and portfolio holdings from June 2007 until July 2015.

Mostly, we consider it unlikely that these sample requirements should have a systematic relation to market timing ability, except for the requirement about returns data availability, which could cause a survivorship bias. We address the potential survivorship bias later in the chapter.

6.1.1 Sample subcategories

We categorize the different funds into three subcategories, depending on where they invest. The categories are funds investing in:

- Norway only
- Norway and the Nordics
- Norway and globally

We sort the funds to these categories by quantitative and qualitative assessments such as reading the fund mandates and looking up their current and historic asset holdings. The division into geographical asset categories is done to fit the substantial proportions of holdings. See appendix 10.1.1 for list of which funds are in which categories.

6.2 Data Sources

6.2.1 Fund Returns data

We access fund NAV data from Børsprosjektet, administered by NHH. We collect and sort the data to a monthly frequency for all 22 funds in sample for the relevant period. We are interested in the total fund return to the investor, which means returns after fees. None of the funds in our sample pays dividends to investors, and hence we can compute series of total return for the funds from NAV values at month end closing price alone.

$$total\ return_t = \frac{NAV_t - NAV_{t-1}}{NAV_{t-1}}$$

6.2.2 Portfolio Holdings data

We collect data on portfolio constituents for the 22 funds from Morningstar Direct on a monthly frequency. This dataset contains every asset that the funds hold in their portfolio on any month-end within the sample period. We divide the different assets into six different categories. For our purpose, we will refer to these as asset classes. These are:

- Norwegian Equity: This asset class is comprised of firms listed on the Norwegian stock exchange.
- Norwegian Bonds: This asset class contains debt issued by Norwegian firms. The asset class also includes all Norwegian government bonds and municipal bonds.
- Nordic Equity: The Nordics excluding Norway. This asset class contains stocks listed on Danish, Swedish and Finnish exchanges.
- Nordic Corporate Bonds: The Nordics excluding Norway. Nordic bonds are all bonds issued by corporate issuers in Denmark, Sweden and Finland.
- Global Equity: Includes equity from any country except Norway
- Global Corporate Bonds: Includes Corporate Bonds from any country except Norway

Out of the 22 funds, 18 have exposure to either Nordic or Global markets in addition to the Norwegian market; 4 funds invest in the Nordics, while the remaining 14 invest globally. The fraction of foreign public debt in the portfolio holdings is very small, and we consider it unsubstantial. Therefore, we only include foreign debt from issued by corporations. By sorting all portfolio holdings into these six asset classes, we create time series on asset class holdings for all funds. As we will see later in figure 10, these asset classes do not always add up to 100%, because we have excluded cash. Financial instruments other than stocks and bonds that have a payoff dependent on one of the six asset classes is sorted into the respective asset class. Such financial instruments are very rare in our sample.

6.2.3 Benchmarks

To evaluate timing performance for our sample, we use benchmarks that are meant to be relevant to the categories mentioned above. We have merged all Norwegian bonds into one category in response to benchmark availability. Our sources for these benchmarks are Datastream and the Norwegian domestic pension fund returns data (The Government Pension Fund Norway. “Avkastning over tid”. 2015). All benchmarks and risk-factors are constructed using total return in Norwegian Krone (NOK). Total return is the correct approach because that is the actual return the investor would get if it where to buy the benchmarks instead of the multi asset-class funds.

Norwegian equity benchmark: OSEFX is a dividend-adjusted version of the OSEBX that consist of the companies at the Oslo Stock Exchange that is available for investment by mutual funds.

Norwegian bonds benchmark: we use the Norwegian bonds benchmark published by Folketrygdfondet, which is composed by 70% of Barclays Capital Global Aggregate Norway (corporate bonds) and 30% Barclays Global Treasury Norway (public bonds).

Nordic excluding Norwegian Equity benchmark: Our analysis treats the Nordic countries except Norway as one asset class. In order to create an index that reflects the performance of these markets, we construct a value-weighted index of the MSCI equity indexes of Denmark, Sweden and Finland. The different indexes are assigned value-weights in the merged index in accordance with stock market value from Datastream.

Nordic excluding Norwegian bonds benchmark: We use the index Barclays Capital Global Aggregate Scandinavia ex Norway published by Folketrygdfondet. This index consists of private bonds issued in Denmark, Sweden and Finland in foreign currency.

Global equity benchmark: MSCI World Index is an equity index that represents 23 developed markets. The index is composed so that the weights for the US, UK and Japan combined makes up 75%.

Global corporate benchmark: The Barclays Global Aggregate Corporate Index reflect the investment grade, fixed-rate, taxable global corporate bonds market.

Risk Free Rate: We choose ST1X as risk free rate for our study. This is the Norwegian Government Bond Index with the shortest duration, 3 months. The probability that the Norwegian government will default on its debt is very small. Therefore, this is the appropriate risk free rate for a Norwegian investor. The duration of a bond is the weighted average of time until the lender receives the loan back.

6.2.4 Risk-factors

The Norwegian size and value factors are constructed as in Johnsen (2011), and Nagy and Sørensen (2010). The large cap portfolio is represented by the OBX-index, which is the 25 most traded stocks in OSEBX. The small cap portfolio is represented by OSESX, the smallest ten percent of companies measured by market cap. The Norwegian size factor is constructed as OBX returns minus OSESX returns.

Norwegian value factor: The value factor is constructed as MSCI Norway Value returns minus MSCI Norway Growth returns. In addition to book-to-market, MSCI also takes into account the 12-month forward earnings to price and dividend yield when constructing the value portfolios. This method is the same for all the MSCI value indexes we use. When constructing the growth portfolio MSCI uses five variables: long-term forward EPS growth rate, short-term forward EPS growth rate, current internal growth rate and long-term historical EPS growth trend and long-term historical sales per share growth trend. We note that these methods are different from the Fama and French approach that only uses the book value to market-price ratio.

The Norwegian term factor is constructed in a comparable method as in Nagy and Sørensen (2010), by subtracting the ST1X returns from the ST5X returns. ST1X is our proxy for the risk-free rate, Norwegian Government Bond Index with 3 months duration. ST5X is a Norwegian Government Bond Index with 5 years duration. With an upward sloping yield curve, this term premium is positive.

We use a Nordic size factor for the funds investing in the Nordics, and for the funds investing globally, we use a global size factor. The Nordic size factor is constructed similarly as in Nagy and Sørensen (2010), and the value weighting is the same as in Nordic equity benchmark construction. For the Nordics, we construct the size factor as the difference between MSCI small cap and MSCI large cap returns in Sweden, Finland and Denmark. The global size factor is constructed as the difference between MSCI World small cap and MSCI World large cap returns.

We also create international value factors. The Nordic value factor is constructed similarly as in Nagy and Sørensen (2010) by a value-weighted average of the value factor from Sweden, Finland and Denmark. Those value factors are constructed like the Norwegian value factor, i.e. by subtracting MSCI growth returns from MSCI value returns. The global value factor is constructed the same way, using MSCI World value and MSCI World growth.

6.3 Data overview

6.3.1 Sample period

The period spans from June 30, 2007, to July 1, 2015. The 8 year period comprises some major events in the financial markets, and hence some major variations in market volatility. Obviously, the financial crisis of 2008 characterizes our time series. The crisis had dramatic impact on asset prices, and equity prices in particular. For the crystal-ball owning fund manager, this period offered massive timing opportunities. The European debt crisis of 2011 is also highly visible in our data, as it is coinciding with a value drop of more than 20% in the OSEFX. The falling interest rates are likely to have made bond investments abnormally profitable over the period. For Norwegian securities, we see increased volatility in the past 12 months of our sample, which is likely to stem from the rapid changes in oil price.

6.3.2 Descriptive statistics Return Data

Table 3 offers an overview of the different index return series we use as benchmarks in our analysis (all returns are total return in NOK). The multi asset-class fund return reported are equally weighted averages of the funds in the sample, and not a portfolio of the multi asset-class funds. In order to calculate the sharpe ratio, we divide the average monthly excess returns multiplied by 12 with the monthly standard deviation of excess returns multiplied by the root of 12 (Bodie, Kane, Marcus, 2011, p. 134).

Table 3: Index Return series overview, sample period 30.06.2007 - 01.07.2015			
Return series	Arithmetic average yearly excess returns	Yearly standard deviation	Sharpe Ratio
Risk-Free rate *(not excess return)*	2,47 %	0,48 %	
Multi asset-class Funds sample	3,22 %	10,32 %	0,312
Norwegian Equity	2,79 %	24,22 %	0,115
Global Equity	5,57 %	12,34 %	0,452
Global Corporate Bonds	2,67 %	12,47 %	0,214
Nordic Equity	5,68 %	17,80 %	0,319
Norwegian Bonds	3,56 %	2,43 %	1,466
Nordic Corporate Bonds	4,42 %	7,59 %	0,582

In table 3, Norwegian bonds stands out with a very high sharpe ratio.

Table 4 shows a correlation matrix between the indexes used in our study.

Table 4: Correlation between returns series, sample period 30.06.2007 - 01.07.2015						
	Multi asset-class Funds	Norwegian Equity	Norwegian Bonds	Global Equity	Global Corporate Bonds	Nordic Equity
Norwegian Equity	0,78					
Norwegian Bonds	-0,11	-0,19				
Global Equity	0,63	0,58	-0,05			
Global Corporate Bond	-0,26	-0,47	0,42	0,17		
Nordic Equity	0,70	0,74	-0,10	0,79	-0,17	
Nordic Corporate Bonds	-0,22	-0,42	0,32	0,20	0,67	-0,04

As we would expect from economic theory, when returns are measured monthly, correlations between stocks and bonds should be low, which is reflected in our data.

Table 5: Risk-factors return series, sample period 30.06.2007 - 01.07.2015			
	Arithmetic average yearly returns	Yearly standard deviation	T-score
SMB Norway	-8,3 %	13,4 %	-1,76
HML Norway	-0,5 %	13,1 %	-0,11
TERM Norway	3,2 %	3,7 %	2,50
SMB Nordic	2,4 %	10,6 %	0,65
HML Nordic	-0,9 %	10,0 %	-0,25
SMB Global	2,0 %	6,3 %	0,92
HML Global	-2,7 %	5,6 %	-1,34

From table 5 we see that our sample period was a horrible time for being exposed to the SMB Norway risk-factor.

Table 6: Correlation between returns series, sample period 30.06.2007 - 01.07.2015

	SMB Norway	HML Norway	TERM Norway	SMB Nordic	HML Nordic	SMB Global
HML Norway	0,02					
TERM Norway	0,11	0,04				
SMB Nordic	0,09	-0,12	-0,23			
HML Nordic	0,06	-0,01	-0,08	0,20		
SMB Global	0,20	-0,17	-0,24	0,50	-0,03	
HML Global	0,08	0,17	0,03	-0,17	0,48	-0,11

From table 6 we see that the risk-factors are almost uncorrelated, except Nordic and Global SMB and HML.

Table 7 provide an overview of the performance of multi asset-class funds in our sample for the sample period. We calculate the Sharpe Ratio in the same manner as in Table 3. The returns series are in NOK.

Table 7: Fund performance overview, sample period 30.06.2007 - 01.07.2015				
Fund name	Fund Sample Number	Arithmetic Average Yearly Excess Return	Yearly Standard Deviation	Sharpe Ratio
Alfred Berg Kombi	1	4,98 %	7,73 %	0,6446
Alfred Berg Optimal Allokering	2	1,83 %	9,84 %	0,1860
Atlas Absolutt	3	0,79 %	13,50 %	0,0582
Carnegie Multifond	4	3,00 %	11,36 %	0,2637
Danske Invest Kvantitativ Allokering	5	5,32 %	13,57 %	0,392
Delphi Kombinasjon	6	4,94 %	9,50 %	0,520
DNB Aktiv 10	7	1,41 %	2,39 %	0,589
DNB Aktiv 50	8	2,45 %	8,18 %	0,299
DNB Aktiv 80	9	4,33 %	10,86 %	0,399
Eika Balansert	10	3,74 %	9,69 %	0,386
Fondsfinans Aktiv 60 40	11	2,25 %	19,11 %	0,118
Nordea Plan 10	12	1,37 %	2,12 %	0,648
Nordea Plan 30	13	2,10 %	4,94 %	0,424
Nordea Plan 50	14	2,82 %	7,81 %	0,361
Nordea Plan 65	15	3,05 %	9,97 %	0,306
Nordea Plan 80	16	3,34 %	12,14 %	0,275
Nordea Stabil Avkastning	17	3,25 %	7,23 %	0,449
Pareto Nordic Return A	18	11,08 %	17,34 %	0,639
Storebrand Kombinasjon	19	2,53 %	8,97 %	0,282
Vekterfond Trygg	20	2,00 %	3,62 %	0,554
Vekterfond Balansert	21	2,34 %	7,57 %	0,310
Vekterfond Offensiv	22	2,58 %	11,17 %	0,231

Table 7 show great variation between the funds' returns and standard deviations. Measured by sharpe ratio, the best performing fund has been Nordea Plan 10, closely followed by Alfred Berg Kombi and Pareto Nordic Return A. The poorest performer in the sample is Atlas Absolutt, which also has the highest management fee as we in table 9. During our sample period, interest rates have been falling, and funds with a higher share of bonds, such as Nordea Plan 10 and DNB Aktiv 10, have better risk-adjusted performance than funds with a higher share of equity, e.g. Nordea Plan 80 and DNB Aktiv 80. In absolute return, Pareto Nordic A is by far the best performer.

6.3.3 Descriptive statistics Portfolio Holdings Data

The Monthly holding data we use in this study go back to June 2007, with the exception of Nordea Plan funds, for which we only have holding data for from September 2009 and onwards. In Figure 10 we show graphically the developments in the average holdings across funds in the different asset classes. Nordic and global Bonds and Equities are merged in the figure. We see that on average, the funds in the sample has increased their holdings of international securities relatively to Norwegian securities over the period. This might be because managers want to diversify even more. The Norwegian securities market is only a small part of the global financial markets, and better diversification could easily be achieved by holding more international securities.

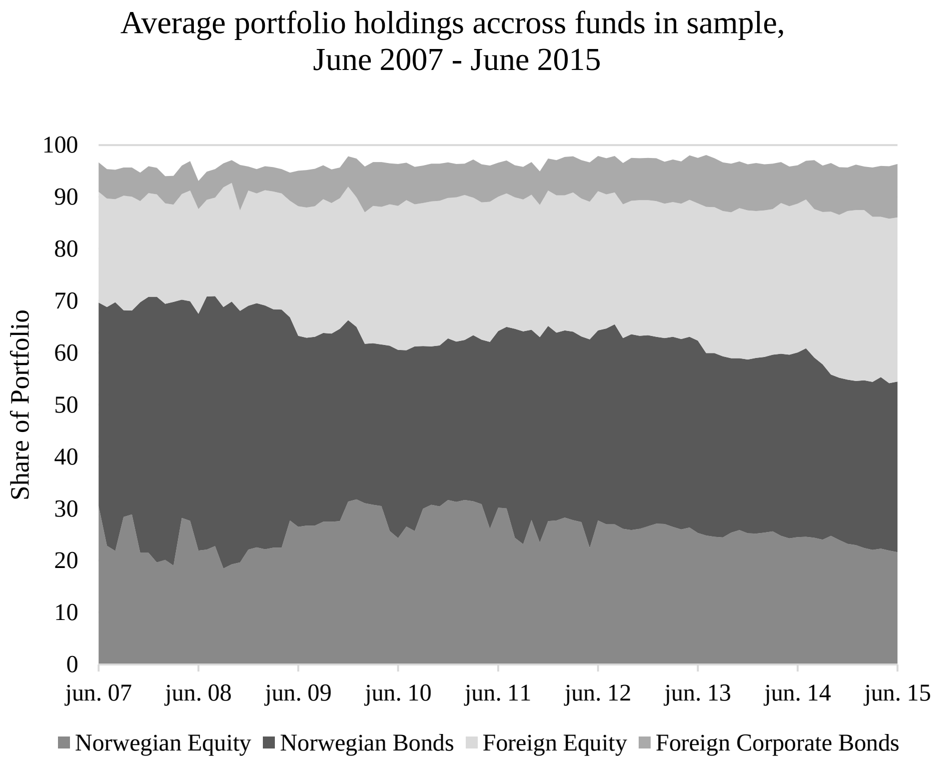


Figure 10: Average portfolio holdings across funds in sample

Average holdings and their respective standard deviations for each individual fund can be found in table 8. We note that the standard deviations differ substantially between funds. A high degree of fluctuations in an asset class allocation indicates a higher degree of market timing activity, relatively to the other funds. From our data it seems that funds investing globally, might be less active market timers compared with funds investing in Norway and the Nordic countries.

Table 8: Average asset class holdings and standard deviations, pr. fund, %, 30.06.2007 - 01.07.2015

		Norwegian Equity	Norwegian Bonds	International Equity	International Corporate Bonds
Alfred Berg Kombi	Average	29,28	59,64	0,00	7,18
	Std.dev	*4,12*	*6,58*	*0,00*	*3,94*
Alfred Berg Optimal Allokering	Average	16,57	46,17	30,11	2,80
	Std.dev	*7,24*	*12,03*	*9,41*	*3,38*
Atlas Absolutt	Average	33,52	44,52	8,73	5,51
	Std.dev	*16,91*	*20,31*	*5,25*	*4,91*
Carnegie Multifond	Average	54,96	43,15	1,07	0,00
	Std.dev	*6,21*	*5,50*	*1,16*	*0,00*
Danske Invest Kv. Allokering	Average	71,60	23,54	0,00	0,00
	Std.dev	*44,16*	*38,65*	*0,00*	*0,00*
Delphi Kombinasjon	Average	20,24	46,98	22,33	0,20
	Std.dev	*5,34*	*9,96*	*6,50*	*0,44*
DNB Aktiv 10	Average	6,56	81,07	3,09	5,21
	Std.dev	*4,28*	*10,21*	*3,18*	*4,64*
DNB Aktiv 50	Average	15,53	41,18	37,74	2,69
	Std.dev	*3,04*	*4,87*	*3,20*	*5,12*
DNB Aktiv 80	Average	23,48	20,76	51,13	1,41
	Std.dev	*4,39*	*7,35*	*7,51*	*2,80*
Eika Balansert	Average	21,20	47,33	22,23	2,78
	Std.dev	*4,95*	*9,07*	*7,02*	*2,49*
Fondsfinans Aktiv 60/40	Average	76,60	17,60	0,00	0,00
	Std.dev	*10,74*	*11,09*	*0,00*	*0,00*
Nordea Plan 10	Average	3,16	58,28	8,57	12,12
	Std.dev	*1,79*	*26,90*	*4,55*	*8,29*
Nordea plan 30	Average	7,72	41,24	20,52	12,53
	Std.dev	*3,81*	*19,91*	*9,45*	*8,06*
Nordea plan 50	Average	12,29	24,05	32,98	12,49
	Std.dev	*5,94*	*13,34*	*14,80*	*8,53*
Nordea plan 65	Average	15,61	16,27	42,32	7,59
	Std.dev	*7,41*	*9,32*	*18,96*	*5,40*
Nordea plan 80	Average	18,89	8,91	51,41	2,97
	Std.dev	*8,86*	*5,77*	*22,96*	*2,65*
Nordea Stabil Avkastning	Average	3,65	31,29	54,14	8,17
	Std.dev	*1,76*	*10,70*	*10,06*	*3,50*
Pareto Nordic Return A	Average	61,71	20,10	7,23	1,72
	Std.dev	*19,63*	*12,95*	*12,27*	*3,18*
Storebrand Kombinasjon	Average	22,17	40,36	36,77	0,00
	Std.dev	*3,05*	*5,84*	*5,51*	*0,00*
Vekterfond Trygg	Average	4,27	41,52	15,54	37,52
	Std.dev	*0,75*	*4,95*	*1,07*	*4,50*
Vekterfond Balansert	Average	10,75	26,27	42,72	20,01
	Std.dev	*1,81*	*2,60*	*3,77*	*4,13*
Vekterfond Offensiv	Average	16,37	10,74	61,33	10,95
	Std.dev	*3,28*	*1,53*	*7,71*	*9,62*

6.4 Fund pricing and fund structure

This section provides a brief description of the structure of the funds in our sample concerning investment allocation and fund pricing, which is closely linked to each other. Table 9 below show the funds' management fees, "comparison fee", policy weight for equities and bonds, the range that equity share is allowed to be, and if the fund is a fund of funds. Some funds have policy weights between stocks and bonds, and some provide what they call a long-term average between stocks and bonds. For the few funds that do not provide this kind of information, we obtain the average weights from table 8 or from the allocation between stocks and bonds in the funds benchmarks.

Table 9: Fund pricing and fund structure

Fund Name	#	Mngmt. fee	comp. fee	Equities	Bonds	Equity range	F-F
Alfred Berg Kombi	1	1,5 %	0,70 %	25 %	75 %	0-50%	N
Alfred Berg Opt. Allo.	2	1,3 %	0,95 %	50 %	50 %	20%-80%	Y
Atlas Absolutt	3	2,0 %	0,89 %	40 %	60 %	0-100%	N
Carnegie Multifond	4	1,2 %	0,93 %	50 %	50 %	-	N
Danske Inv. Kvant. Allo.	5	1,8 %	1,10 %	70 %	30 %	0-100%	N
Delphi Kombinasjon	6	1,5 %	1,00 %	50 %	50 %	30%-70%	N
DNB Aktiv 10	7	0,6 %	0,57 %	10 %	90 %	10%-12,5%	Y
DNB Aktiv 50	8	1,2 %	0,95 %	50 %	50 %	40%-60%	Y
DNB Aktiv 80	9	1,3 %	1,24 %	80 %	20 %	65%-85%	Y
Eika Balansert	10	1,5 %	1,00 %	50 %	50 %	30%-70%	N
Fondsfinans Aktiv 60 40	11	1,0 %	1,01 %	60 %	40 %	55%-65%	N
Nordea Plan 10	12	0,8 %	0,57 %	10 %	90 %	0-25%	Y
Nordea Plan 30	13	1,0 %	0,76 %	30 %	70 %	15%-45%	Y
Nordea Plan 50	14	1,2 %	0,95 %	50 %	50 %	35%-65%	Y
Nordea Plan 65	15	1,4 %	1,09 %	65 %	35 %	50%-80%	Y
Nordea Plan 80	16	1,5 %	1,24 %	80 %	20 %	65%-95%	Y
Nordea Stabil Avkastn.	17	1,3 %	0,95 %	50 %	50 %	25%-75%	Y
Pareto Nordic Return A	18	1,2 %	1,20 %	70 %	30 %	0-100%	N
Storebrand Kombinasjon	19	1,2 %	0,95 %	50 %	50 %	30%-70%	Y
Vekterfond Trygg	20	1,0 %	0,67 %	20 %	80 %	-	Y
Vekterfond Balansert	21	1,3 %	0,95 %	50 %	50 %	-	Y
Vekterfond Offensiv	22	1,5 %	1,24 %	80 %	20 %	-	Y

– Indicates equity range not available.

We calculate a "comparison fee" in order to compare the pricing of the funds with the price one would pay when buying equity and bond funds separately. We use category average management fees for 2014 from Morningstar Direct. For Norwegian Equity, this is 1,37%, for Global Large-Cap Blend Equity it is 1,48% (this category is appropriate because many global equity funds in NOK are in this category), for Nordic Equity it is 1,65%, and for NOK Bonds 0,48%. We use this price for all bonds. Then we assume a stock mix of 50/50 Norwegian and international for the international funds. For a global fund, the calculation would look like this:

$$Comparison\ fee = Policy\ weight\ stocks * 0{,}5 * (1{,}37\% + 1{,}48\%) + Policy\ weight\ bonds * 0{,}48\%$$

From table 9 we see that most of the funds are clearly priced a premium relative to the comparison fee we constructed. This means that investors could create their own portfolio with similar asset class mix with lower management fees. Therefore, to justify their price, the funds should offer something more than what the investor could achieve by creating her own portfolio. Whether the funds are able to add value by market timing or not is the topic for the next chapter. In addition to the management fee, some funds also have buying and selling fees, but this varies with the amount the investors is buying and is therefore excluded. The funds in our sample do not have performance fees.

The funds in our sample varies a lot in the degree of freedom regarding their equity share, the funds from DNB have the narrowest ranges, and some funds, such as Pareto Nordic Return A and Atlas Absolutt, do not have any restrictions.

The funds from the large commercial banks and insurance companies usually have a fund in fund structure where the funds invest in other stock and bond funds from the same institution. The multi asset-class funds provided by investment banks or independent asset management firms usually invest directly in stocks and bonds.

6.5 Data issues

6.5.1 Benchmark relevance

The chosen benchmarks are broad indexes meant to reflect total markets. For a benchmark to be a fair performance comparison to a fund, it should be a relevant alternative to investing in the fund. We know that some of the funds in our sample do not invest broadly in an entire asset class, but rather chooses a few individual securities. In such cases, the index might only be able to explain a small part of variations in fund returns.

The OSEFX index is designed to represent the securities that Norwegian mutual funds are allowed to invest in, therefore this a good benchmark for our analysis. There is no publicly available Norwegian corporate bond index. Most Norwegian funds with a portfolio of Norwegian corporate bonds use a Norwegian government bond index as their benchmark. We believe this index is not appropriate to measure the funds' performance, as it does not consider the additional risks associated with corporate bonds, and therefore we use Norwegian bond benchmark published by the Government Pension fund Norway (Folketrygdfondet). A weakness with this is that the funds in our sample might not have the same strategic allocation of government debt (30%) and corporate debt (70%) as the benchmark. Still, we find this index where government bonds and private bonds are merged to be the best available index to reflect the holdings in our sample. Our Nordic equity index is value weighted, and this weighting method results in a larger portion in Finland then most of the funds in our sample have. Our Nordic bonds index Barclays Capital Global Aggregate Scandinavia excludes Norway which means we can measure the Scandinavian bond exposure separately, this index is also from Government Pension fund Norway. Our global equity index might have different geographical distribution of constituents; then our funds global equity portfolios, however they mostly seem to be very similar with, large holdings in US equity markets. The Barclays Global Aggregate Corporate Index consists only of investment grade, which is not ideal since some of our funds could own riskier debt.

6.5.2 Survivorship Bias

Our data may suffer from survivorship bias. The collected data does not contain dead funds, and hence, survivorship bias may arise. The non-survivors generally exhibit poor performance, and as Brown et al. (1992) find, any sample that is partially contingent on returns may have a survivorship bias. The bias is likely to positively inflate any statements made about the performance of the population as a whole, because the lower returns from the dead funds is removed from the averages. The problems that arise from survivorship bias are increasing when we add more years to our sample period. Swensen (2009, p. 78) suggests that in some cases, completely removing survivorship bias can be impossible, although approximations can be done through estimations of medians in samples with and without non-survivors.

6.5.3 Data format difficulties

Morningstar does not classify many of the assets in the funds' portfolio holdings. This unclear reporting may have caused misclassification of some securities.

7. Results

In this chapter, we will present the results from the different methods described in the methodology chapter. First, we will present our returns based approaches, and then we will present the holding based approach. We also include an analysis of the regression residuals. Throughout this chapter, we will refer to significance as being statistically significant on a five percent level, i.e. a coefficient having a p-value of 0,05 or less. The tables in the chapter summarizes the results from the different methods. Complete regression results for all individual funds can be found in the appendix 10.1.2-6.

7.1 Results from the TM and HM models

7.1.1 Results from the TM model

The TM returns-based model as specified in model 2 and 3 explains a significant portion of the variance in excess returns for the funds in our sample, as we can see in table 10. The relatively low R^2 of the funds investing in Norwegian securities only, can be explained by one particularly aggressive fund, Danske Bank Kvantitativ Allokering, to which the model only explains 41,3% of variations in returns. The high explanatory power of our models is high, and indicates that we have mostly chosen appropriate benchmarks.

Table 10: TM Model R^2, sorted by Investment geography

	Norway only	Norway & the Nordics	Norway & Global
Number of funds	4	4	14
R^2	0,794	0,834	0,896

Table 11: TM results

This table report results from both of the TM models. The Norway only model is:

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \boldsymbol{\beta_3} Rne_t^2 + \boldsymbol{\beta_4} Rnb_t^2 + \varepsilon_{pt},$$

The International TM model is:

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \boldsymbol{\beta_3} Rne_t^2 + \boldsymbol{\beta_4} Rnb_t^2 + \beta_5 Rie_t + \beta_6 Ricb_t + \boldsymbol{\beta_7} Rie_t^2 + \boldsymbol{\beta_8} Rib_t^2 + \varepsilon_{pt}.$$

Depending on investment geography, the appropriate regression is done for each fund individually. The table report the cross sectional averages of the coefficients, and the positive and negative share of the coefficients for both all coefficients and significant coefficients. β_1 shows exposure to Norwegian equity, and β_2 show exposure to Norwegian bonds. $\boldsymbol{\beta_3}$ is the timing coefficient for Norwegian equity, and $\boldsymbol{\beta_4}$ is the timing coefficient for Norwegian bonds. β_5 shows exposure to international equity, and β_6 show exposure to international bonds. $\boldsymbol{\beta_7}$ is the timing coefficient for international equity, and $\boldsymbol{\beta_8}$ is the timing coefficient for international bonds. α is the intercept.

For all coefficients:	α	β_1	β_2	$\boldsymbol{\beta_3}$	$\boldsymbol{\beta_4}$	β_5	β_6	$\boldsymbol{\beta_7}$	$\boldsymbol{\beta_8}$
Average	0,0002	0,27	0,15	0,19	-8,64	0,29	-0,3	0,07	0,25
Positive share	22 %	100 %	86 %	77 %	50 %	100%	55 %	83 %	59 %
Negative share	77 %	0 %	14 %	23 %	50 %	0 %	35 %	17 %	41 %
For significant coefficients									
Average	0,00312	0,27	0,3	1,05	-37,53	0,32	-0,17	-1,72	2,09
Positive share	9 %	100 %	41 %	14 %	0 %	89 %	6 %	0 %	18 %
Negative share	0 %	0 %	0 %	0 %	9 %	0 %	12 %	6 %	6 %

All of the funds in the sample have significant exposure to Norwegian equity. While most of the funds are not able to time Norwegian equity, we note that 3 funds, or 14%, have a positive and significant Norwegian equity timing coefficient. For comparison, Clare et al. (2015) finds only 3,9% positive and significant timing ability among multi asset-class funds in Canada, and even less in the US and UK, using a multi asset class TM model. Generally, studies employing the TM quadratic regression often get negative significant coefficients on equity markets, such as Volkmann (1999) and Lonkani et al. (2013).

The funds that are able to time Norwegian equity are Danske invest Kvantitativ Allokering, Atlas Absolutt and Pareto Nordic Return A. We note that these three funds operate without a rebalancing rule, which allow them to allocate freely to Norwegian equity. None of the funds has significant alphas. When one considers the alphas, one should be aware of the management fees. We calculate returns from the funds' net asset values, meaning that all fund returns are after fees. For the funds in our sample, most of the alphas are quite close to zero, which implies that the returns before fee would yield a positive alpha.

Most funds have significant exposure to international equity. We see that none of the fund have positive market timing ability, but two funds have negative timing coefficients on international equity. One of these funds is Atlas Absolutt. We find it interesting that they have positive market timing skill in one equity market, and negative in the other.

That only 41% get a significant result on exposure to the Norwegian bond benchmark could be caused by the fact that some funds have little Norwegian bonds in their portfolios, as we can see in table 8. Clare et al. (2015) get similar results for their bond indexes. When a benchmark is insignificant in explaining fund returns, we find it unreasonable to put much emphasis on the corresponding timing coefficient. For example, Fondsfinans 60/40 has a negative and significant Norwegian bonds timing coefficient, which we believe could be caused by their strategic change to a higher allocation to bonds in the sample period. On the other hand, the Nordea Plan funds have significant exposure to the Norwegian bonds benchmark, but tend to get negative timing coefficients; this indicates that they have unfortunate timing ability on Norwegian bonds.

The Nordic funds get a negative exposure but positive timing coefficients on Nordic bonds. However, these funds have very little allocation to this asset class, and therefore we are not sure if the estimates are trustworthy.

When we evaluate the results from the international corporate bonds exposure, we see some coefficients that seem unreasonable. We assume this is related to index relevance problems, because we are not sure if the index is an appropriate comparison to the funds' investment universe. For example, Nordea Stabil Avkastning has a portfolio containing global high-yield bonds, which are not reflected in our benchmark with only investment-grade bonds.

7.1.2 Results from the HM model

The multi asset class HM returns-based analysis model, as specified in model 4 and 5, explains slightly less of variations in fund return than the TM model as measured by R^2.

Table 12: HM-Model R^2, sorted by Investment geography

	Norway only	Norway & the Nordics	Norway & International
Number of funds	4	4	14
R^2	0,791	0,822	0,896

We report the results in the same manner as we reported the TM results.

Table 13: HM results

This table report results from both of the HM models. The Norway only model is:

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \boldsymbol{\beta_3} Max(Rne_t, 0) + \boldsymbol{\beta_4} Max(Rnb_t, 0) + \varepsilon_{pt}$$

and for the International HM model is:

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \boldsymbol{\beta_3} Max(Rne_t, 0) + \boldsymbol{\beta_4} Max(Rnb_t, 0) + \beta_5 Rie_t + \beta_6 Ricb_t + \boldsymbol{\beta_7} Max(Rie_t, 0) + \boldsymbol{\beta_8} Max(Ricb_t, 0) + \varepsilon_{pt}$$

Depending on investment geography, the appropriate regression is done for each fund individually. The table report the cross sectional averages of the coefficients, and the positive and negative share of the coefficients for both all coefficients and significant coefficients. β_1 shows exposure to Norwegian equity, and β_2 show exposure to Norwegian bonds. $\boldsymbol{\beta_3}$ is the timing coefficient for Norwegian equity, and $\boldsymbol{\beta_4}$ is the timing coefficient for Norwegian bonds. $\boldsymbol{\beta_7}$ is the timing coefficient for international equity, and $\boldsymbol{\beta_8}$ is the timing coefficient for international bonds. α is the intercept.

For all coefficients:	α	β_1	β_2	$\boldsymbol{\beta_3}$	$\boldsymbol{\beta_4}$	β_5	β_6	$\boldsymbol{\beta_7}$	$\boldsymbol{\beta_8}$
Average	-0,0006	0,24	0,25	0,05	-0,22	0,27	-0,05	0,05	0,05
Positive share	18 %	95 %	86 %	77 %	50 %	100 %	61 %	83 %	56 %
Negative share	82%	0 %	14 %	23 %	50 %	0 %	33 %	17 %	39 %
For significant coefficients									
Average	-	0,25	0,39	0,41	-	0,3	-0,25	0,15	-
Positive share	0 %	95 %	41 %	9 %	0 %	89 %	6 %	17 %	0 %
Negative share	0 %	0 %	0 %	0 %	0 %	0 %	11 %	0 %	0 %

On Norwegian equity, the results are similar as with TM, though the share of funds with timing on Norwegian equity changed to 9% because Pareto Nordic Return A does not have a significant timing coefficient. Most of the funds do not have a significant coefficient on the Norwegian bond benchmark, which is similar to the TM results. No fund have a significant timing coefficient for Norwegian bonds.

The notable findings from the international funds is that three of them, 17%, have significant and positive exposure and timing coefficient to international equity. All of these three funds have a global equity portfolio.

According to the HM model, no fund has a significant alpha.

7.1.3 Comparison of the TM and HM models

The TM and HM analysis return mostly consistent results. Table 14 show the correlation between the timing coefficients on the different asset classes.

Table 14: Correlations between results in the HM and TM models

Timing coefficient	*corr. HM & TM*
Norwegian Equity	0,96
Norwegian Bonds	0,98
Nordic Equity	0,87
Nordic Corporate Bonds	0,99
Global Equity	0,81
Global Corporate Bonds	0,95

As one might expect, the results using the TM and HM models are very similar. The main difference is that the HM analysis does not return any negative and significant timing coefficients. HM showed some significant positive timing ability on the asset class foreign equity. We add that these funds had positive, but not significant, coefficients in the TM results.

7.2 Results from the multi-factor TM and HM models

7.2.1 Results from the multi-factor TM model

Table 15: Multi-factor TM Model R2, sorted by Investment geography

	Norway only	Norway & the Nordics	Norway & Global
Number of funds	4	4	14
R^2	0,803	0,865	0,908

Table 16: Multi-factor TM results

This table report results from both of the multi-factor TM models. The multi-factor TM model for Norway only is:

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \boldsymbol{\beta_3} Rne_t^2 + \boldsymbol{\beta_4} Rnb_t^2 + \beta_5 SMBNOR_t + \beta_6 HMLNOR_t + \beta_7 TERMNOR_t + \varepsilon_{pt}$$

The International multi-factor TM model is:

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \boldsymbol{\beta_3} Rne_t^2 + \boldsymbol{\beta_4} Rnb_t^2 + \beta_5 Rie_t + \beta_6 Ricb_t + \boldsymbol{\beta_7} Rie_t^2 + \boldsymbol{\beta_8} Ricb_t^2 + \beta_9 SMBNOR_t + \beta_{10} HMLNOR_t + \beta_{11} TERMNOR_t + \beta_{12} SMBINT_t + \beta_{13} HMLINT_t + \varepsilon_{pt}$$

Depending on investment geography, the appropriate regression is done for each fund individually. The table report the cross sectional averages of the coefficients, and the positive and negative share of the coefficients for both all coefficients and significant coefficients. β_1 shows exposure to Norwegian equity, and β_2 show exposure to Norwegian bonds. $\boldsymbol{\beta_3}$ is the timing coefficient for Norwegian equity, and $\boldsymbol{\beta_4}$ is the timing coefficient for Norwegian bonds. $\boldsymbol{\beta_7}$ is the timing coefficient for international equity, and $\boldsymbol{\beta_8}$ is the timing coefficient for international bonds. α is the intercept. For risk factor value exposure and other individual fund coefficients, see appendix 10.1.4

For all coefficients:	α	β_1	β_2	$\boldsymbol{\beta_3}$	$\boldsymbol{\beta_4}$	β_5	β_6	$\boldsymbol{\beta_7}$	$\boldsymbol{\beta_8}$
Average	0,0004	0,27	0,27	0,22	-8,24	0,29	-0,01	-0,11	0,23
Positive share	27 %	100 %	95 %	82 %	50 %	100 %	71 %	61 %	71 %
Negative share	73 %	0 %	5 %	18 %	50 %	0 %	29 %	39 %	29 %
For significant coefficients									
Average	0,004	0,27	0,36	0,56	-35,39	0,33	-0,07	-1,74	0,00
Positive share	14 %	100 %	50 %	18 %	0 %	83 %	6 %	0 %	0 %
Negative share	0 %	0 %	0 %	9 %	9 %	0 %	6 %	6 %	0 %

When we include the risk factors HML, SMB and a term premium in the TM analysis, we get somewhat different results. The table only reports the coefficients that are comparable to the TM and HM models without additional risk factors, for full results see appendix 10.1.4. In summary, our results show that while more than 50% of funds have significant and positive exposure to the Norwegian SMB factor, only one fund has significant exposure to the Norwegian HML factor. Four of the funds have significant exposure to the term premium. These results for Norwegian SMB and HML exposure is similar to the findings of Næs, Skjeltorp and Ødegård (2008). For the International funds, the results show some negative exposure to the international HML factor, and almost no significant exposure to the international SMB factor. These results for international risk-factor exposure is similar to Cakici (2015). Since the additional risk factors are significant explanatory variables, they make the model a better specification of fund returns. Therefore, we believe this result is a more precise estimate of fund performance and timing ability than the model without additional risk factors.

All of the funds still have significant exposure to the Norwegian equity benchmark, and in addition, we see that more funds now have significant timing coefficients on Norwegian equity. The share of funds with significant and positive timing skill is now 18%, up from 13% before the additional risk factors where included. Three of the funds are the same as in the first TM model, and the fourth is DNB Aktiv 80. We note that DNB Aktiv 80 has a relatively high portion of equity in its portfolio. The first three are allowed to vary their allocation to equity without restrictions, while DNB Aktiv 80 has a much more limited allocation range than the other funds that have significant timing ability; they are limited to vary their equity exposure between 65 and 85 percent. Intuitively, we see that detecting market timing skill is likely to be more difficult when the funds have less degrees of freedom, using our methods. The methods we use fail to distinguish between the manager's information advantage, and the manager's response to this information (Jiang 2003). This means that if a manager does not have the opportunity to be aggressive in his response, being detected as a market timer requires extraordinary information advantage.

Pareto Nordic Return A has, unlike the other funds, a positive and significant alpha in addition to its positive and significant timing coefficient. This means they have both superior stock picking skills and market timing skills. Pareto has a negative and significant exposure to Norwegian HML, see appendix 10.1.4.

However, we also note that some funds now have negative coefficients on Norwegian Equity. Nevertheless, these results from Norwegian equities are overall far more positive than what Volkmann (1999) found in US equity markets using similar methods; he found that 11,4% had significant and positive, and 45,5% significant and negative timing ability.

For Norwegian bonds, we see that as with the original TM model, the funds with a significant timing coefficient do not have significant exposure to the Norwegian bond index, and thus, we disregard the bonds' timing coefficients.

The most notable results from the international model with additional factors is that none of the timing coefficients on international bonds is significant. This is an improvement, because the original TM model reports significant timing ability for funds that do not have significant benchmark exposure. For international equity there is no significant timing, except for Atlas Absolutt, who still has unfavourable timing skill on Nordic equity.

7.2.2 Results from the multi-factor HM model

Table 17: Multi-factor HM Model R2, sorted by Investment geography

	Norway only	Norway & the Nordics	Norway & Global
Number of funds	4	4	14
R^2	0,801	0,851	0,907

Table 18: Multi-factor HM results

This table report the results from both of the multi-factor HM models. For Norway only this is:

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \boldsymbol{\beta_3} Max(Rne_t, 0) + \boldsymbol{\beta_4} Max(Rnb_t, 0) + \beta_5 SMBNOR_t + \beta_6 HMLNOR_t + \beta_7 TERMNOR_t + \varepsilon_{pt}$$

The international multi-factor HM model is:

$$Rp_t = \alpha_p + \beta_1 Rne_t + \beta_2 Rnb_t + \boldsymbol{\beta_3} Max(Rne_t, 0) + \boldsymbol{\beta_4} Max(Rnb_t, 0) + \beta_5 Rie_t + \beta_6 Ricb_t + \boldsymbol{\beta_7} Max(Rie_t, 0) + \boldsymbol{\beta_8} Max(Ricb_t, 0) + \beta_9 SMBNOR_t + \beta_{10} HMLNOR_t + \beta_{11} TERMNOR_t + \beta_{12} SMBINT_t + \beta_{13} HMLINT_t + \varepsilon_{pt}$$

Depending on investment geography, the appropriate regression is done for each fund individually. The table report the cross sectional averages of the coefficients, and the positive and negative share of the coefficients for both all coefficients and significant coefficients. β_1 shows exposure to Norwegian equity, and β_2 show exposure to Norwegian bonds. $\boldsymbol{\beta_3}$ is the timing coefficient for Norwegian equity, and $\boldsymbol{\beta_4}$ is the timing coefficient for Norwegian bonds. $\boldsymbol{\beta_7}$ is the timing coefficient for international equity, and $\boldsymbol{\beta_8}$ is the timing coefficient for international bonds. α is the intercept. For risk factor value exposure and other individual fund coefficients, see appendix 10.1.5.

For all coefficients:	α	β_1	β_2	$\boldsymbol{\beta_3}$	$\boldsymbol{\beta_4}$	β_5	β_6	$\boldsymbol{\beta_7}$	$\boldsymbol{\beta_8}$
Average	-0,00008	0,24	0,42	0,06	-0,30	0,28	-0,02	0,01	0,04
Positive share	18 %	100 %	91 %	68 %	36 %	94 %	4 %	78 %	76 %
Negative share	82 %	0 %	9 %	32 %	64 %	6 %	59 %	22 %	24 %
For significant coefficients									
Average	0,00533	0,24	0,51	0,38	-1,10	0,32	-0,10	0,09	-
Positive share	5 %	95 %	55 %	14 %	0 %	83 %	6 %	6 %	0 %
Negative share	0 %	0 %	0 %	0 %	9 %	0 %	6 %	0 %	0 %

When we include additional risk factors in the HM model, the share of funds with timing ability on Norwegian equity increases from 9% to 14%. The funds that have timing skill are now the same as in the original TM model. However, the model with additional risk factors also return some negative timing skill on Norwegian bonds. The funds with the significant negative timing coefficients also have significant exposure to the Norwegian bonds benchmark. This is consistent with the results from our first TM analysis.

The results from the international HM with additional factors modifies the results from the first HM test, which reported that 17% of the funds have timing ability on international equity.

Vekterfond Balansert show timing ability on international equity, and Vekterfond Trygg and Offensiv also show indications of good timing ability. For the other funds, there is no visible market timing skill.

7.2.3 Comparison of the multi-factor TM and HM models

Table 19: Correlations between results in the multi-factor HM and TM models

Timing coefficient	*Corr. multi-factor HM & TM*
Norwegian Equity	0,96
Norwegian Bonds	0,98
Nordic Equity	0,84
Nordic Corporate Bonds	0,99
Global Equity	0,87
Global Corporate Bonds	0,92

Like the TM and HM without additional risk factors, the multi-factor TM and HM models have coefficients with high correlation.

7.3 Results from the holding based analysis

After having performed the returns analysis, we want to see if the portfolio holdings analysis yield similar results. As we show in model 10, the dependent variable, %ΔAC, is the change in asset class j holdings at time t. $R_{j,t+z}$ is the excess return for the j asset class over the next z months. If there is a strong positive relationship between these variables, it might indicate that the fund managers increase their holding in an asset class before a subsequent positive return, and thus are able to time that asset class. The sample size for Norwegian equity and bonds is 22 funds, 18 funds have international equity and 17 have international corporate bonds.

$$\%\Delta AC_{j,t} = \alpha + \beta_j R_{j,t+z} + \varepsilon_{j,t} \quad (10)$$

We report the results from the holding based analysis in four tables. The first row shows what time horizon the β_j is estimated for. The second row contains the cross sectional average of β_j in model 10. The third and fifth row show the percentage of positive/ negative β_j. The fourth and sixth row report the percentage of positive/ negative β_j that are statistically significant. Complete regression results can be found in appendix 10.1.6. All 22 funds in the sample are included in Norwegian bond and equities categories. The 4 funds that only invest in Norway are excluded from the international analysis. In the international analysis, the holdings of the funds that invest in the Nordics are individually regressed with our Nordic benchmarks, and the holdings of those who invest globally are individually regressed against our global benchmarks. We exclude one international fund from the global corporate bond analysis because there is no such bonds in its portfolio data for the sample period.

Table 20: Norwegian equity

Months	1	3	6	9	12
Average β	2,41	0,60	-0,08	0,20	0,35
Positive	40,9 %	36,4 %	36,4 %	50,0 %	86,4 %
Positive & sign	4,5 %	4,5 %	0,0 %	0,0 %	0,0 %
Negative	59,1 %	63,6 %	63,6 %	50,0 %	13,6 %
Negative & sign	9,1 %	4,5 %	0,0 %	0,0 %	0,0 %

The average beta is positive for all time horizons, except 6 months horizon. A few funds have significant timing coefficients on 1 or 3 months horizons. The two funds that have positive and significant timing ability in this analysis are Danske Invest Kvantitativ Allokering and DNB Aktiv 80, on 1 and 3 months' time horizons, respectively. This is somewhat consistent with the returns based methods; the multifactor TM showed that both of these funds was successful market timers. With the longer time horizons, not one of the funds show significant positive or negative timing skill. This is quite surprising, since our impression from talking with many of the fund managers was that they attempt to make tactical allocations with payoffs on 6 months to 12 months' time horizons. In addition, if one were to find timing ability, one would intuitively expect it to be in the local market, since the managers might have some information advantage in their home market. Overall, there is only a few instances of negative or positive timing ability in Norwegian equities. This is consistent with the results of Clare et al. (2015), who found only a few funds that had significant timing ability in the equity markets of the US, UK and Canada, using the same holdings based method.

Table 21: Norwegian bonds					
Months	1	3	6	9	12
Average β	9,64	5,07	-6,27	-6,83	0,32
Positive	54,5 %	36,4 %	31,8 %	40,9 %	40,9 %
Positive & sign	4,5 %	0,0 %	4,5 %	0,0 %	0,0 %
Negative	45,5 %	63,6 %	68,2 %	59,1 %	59,1 %
Negative & sign	0,0 %	4,5 %	0,0 %	4,5 %	0,0 %

The Norwegian bonds analysis show that DNB Aktiv 80 has favourable timing skill on Norwegian bonds on 1 month horizon. One other fund is able to time Norwegian bonds on 6 months horizon, while two other funds have unfavourable timing ability on 3 and 9 months horizons.

Generally, our impression is that the managers rarely attempt to time their exposure to bond market returns. The focus seems to be on timing the stock market. This was confirmed in an interview, where one fund manager told us that bonds are mostly used as a buffer when attempting to time the stock markets.

Table 22: International equity					
Months	1	3	6	9	12
Average β	-7,56	0,58	-0,88	-0,20	0,01
Positive	44,4 %	61,1 %	50,0 %	50,0 %	44,4 %
Positive & sign	11,1 %	11,1 %	0,0 %	0,0 %	0,0 %
Negative	55,6 %	38,9 %	50,0 %	50,0 %	55,6 %
Negative & sign	0,0 %	0,0 %	0,0 %	0,0 %	0,0 %

On the 1 month and 3 month horizon, a few funds get statistically positive coefficients in our international equity analysis. DNB Aktiv 10 have a positive and statistically significant coefficient on 1 and 3 month horizons. Our results from both international and Norwegian equity markets are more negative than what Jiang, Yao and Yu (2007) found in the US equity market, with a holding based method. They found clear evidence of successful market timing on average among actively managed US mutual funds.

Table 23: International corporate bonds					
Months	1	3	6	9	12
Average β	0,38	1,46	0,97	0,55	-0,11
Positive	52,9 %	58,8 %	70,6 %	41,2 %	29,4 %
Positive & sign	0,0 %	0,0 %	5,9 %	5,9 %	5,9 %
Negative	47,1 %	41,2 %	29,4 %	58,8 %	70,6 %
Negative & sign	5,9 %	0,0 %	0,0 %	0,0 %	11,8 %

Our analysis show that there are some ability to time international corporate bonds; Atlas Absolutt has timed its exposure to Nordic corporate bonds successfully on 6, 9 and 12 month horizons. This was not detected in the returns based analysis, probably because Atlas' allocation to this asset class is on average only 5,51 % with a standard deviation of 4,91%. Apart from this, we see some negative timing ability.

7.4 Error term evaluation

We use OLS to obtain our results, and therefore we want to test some of the OLS assumptions.

Test results for OLS assumptions TM analysis can be found in appendix 10.1.7. Fund 2 have positive autocorrelation, all the other funds are either inconclusive or no evidence of autocorrelation. Eight of the funds have heteroscedasticity in the residuals. Five of the funds does not have normally distributed errors according to our test.

Testing OLS assumptions HM analysis see appendix 10.1.8. Fund 2 and 6 have positive autocorrelation, all the other funds are either inconclusive or no evidence of autocorrelation. Twelve of the funds have heteroscedasticity in the residuals. Eight of the funds does not have normally distributed residuals.

Testing OLS assumptions multi-factor TM analysis see appendix 10.1.9. Test results show that there is either no evidence for autocorrelation, or inconclusive test values for all the funds. Three of the funds have heteroscedasticity in the residuals, note that that risk factor SMB international have been removed from the white test for the international funds because our software was not able to handle all the variables. Six funds does not have normally distributed errors.

Testing OLS assumptions multi-factor HM analysis see appendix 10.1.10. . Test results show that there is either no evidence for autocorrelation, or inconclusive test values for all the funds. Three of the funds have heteroscedasticity in the residuals, same procedure as with TM was done with the international funds. Ten of the funds does not have normally distributed residuals.

Testing OLS assumptions holdings analysis see appendix 10.1.13. Fund 22 seems to have negative autocorrelation, in all asset classes and time horizons. Fund 2, 5 and 21 also have positive autocorrelation in some of the tests. Heteroscedasticity seems to be a problem for some of the regressions especially in the international asset classes. With few exceptions, the regressions do not have normally distributed residuals. This is not very surprising, because we did not expect that shifts in portfolio holdings would be normally distributed. Most of the variation in portfolio changes in not explained by asset class returns, as specified in model 10, therefore there is a lot of residual portfolio changes that are not normally distributed.

Because many of our regressions do not meet the OLS assumptions, we use the Huber/White/sandwich robust variance estimator. As explained in the methodology chapter, we hope this ensures correct standard errors and therefore correct t-statistics.

7.4.1 Variance inflation factor multi-factor TM and HM

Almost all the VIFs are under ten, which means that multicollinearity is probably not a problem. For the multi-factor HM analysis, the Nordic funds seems to have a problem with collinearity with Norwegian and Nordic equity. Fortunately, the coefficients we are most interested in, the timing coefficients, seems to be ok. See appendix 10.1.11-12.

7.5 Summary of analysis results

Our TM and HM analysis show that most funds in our sample do not have timing ability, but we find indications that some individual funds have significant ability to time Norwegian equity. Judging by our equity timing coefficients, our results are a bit more indicative of timing ability than previous studies using TM and HM in other markets.

Our multi-factor model results are similar to the TM and HM models results, but when the additional risk factors are incorporated, more funds have significant negative or positive timing skill in Norwegian equity. The results show that while most of the funds with timing ability are unrestricted in terms of equity allocation, DNB Aktiv 80 has market timing skill despite its limited degrees of freedom. All the successful timers of Norwegian equity have high shares of this asset class in their portfolios.

Generally, even though they are actively managed, only a few funds show significant security selection skill trough positive alphas. Those who do are usually not able to time the market, with the exception of Pareto Nordic Return A.

The holdings based timing measure show that a few funds have positive and a few funds have negative timing skill. Two of the funds that are successful market timers in the returns based analysis are also among those who time the market successfully according to the holdings model. One fund, Atlas Absolutt, is able to time its exposure to Nordic corporate bonds favourably. However, with a 5% statistical significance level, our number of statistically significant results are generally no larger than one would expect from a sample with no timing skill. Overall, the majority of funds has neither superior nor inferior timing ability, using the holdings based methods.

Both the results from the returns based methods and the holding based method show that a few funds have some positive or negative timing ability. However, we saw clearly that the large majority of funds neither have positive or negative timing skill. The highest share of funds with timing ability was 18%, in the multi-factor TM model for Norwegian equity. Some funds stand out with positive results; Pareto Nordic Return A show convincing timing ability in the TM models, and in addition, it achieves a positive and significant alpha when additional risk factors are accounted for. Danske Invest Kvantitativ Allokering stands out in the sample with statistically significant positive timing in Norwegian equites in several of the return based methods, and on one-month horizon in the holdings based method. Delphi Kombinasjon achieves a positive and significant alpha in all four returns based models.

7.6 Case Study: The Financial Crisis

The concept of market timing in an academic context is usually limited to studying the significance of coefficients. Such studies may provide important insights, but may not always answer the qualitative questions of retail investors. For example, investors might wish to know how a fund was positioned when the financial crisis of 2008 started, or if a fund bought shares at attractive levels when the markets bottomed out. With our extensive dataset, we have the opportunity to shed light upon such questions.

The financial crises was a dramatic period in Norwegian as well as international financial markets. International stock markets reached the trough in March 2009, and then saw asset values increase over 50% the next year (Mishkin, 2010). For the Oslo stock exchange, the development was even more dramatic; the index experienced a value drop of around 60%, with the subsequent recovery providing an increase of approximately 100% over the following 12 months.

We now take a closer look at whether the funds were able to time Norwegian equity during the financial crisis. Our sample period reaches back to around one year prior to the 2008 drop in value of the OSEFX. Figure 11 shows the average value development of the multi asset-class funds in our sample compared to the index. The average of the multi asset-class funds diverge from the OSEFX through financial crises. We see that for most of the time, the average holding of Norwegian equity moves in the same direction as the value development of OSEFX. However, this is not true for the late autumn and winter months of 2008/2009. During this period, the multi asset-class funds on average increased their allocation to Norwegian equity in a period where OSEFX was falling or trading flat. The first sign of counter-market increase in equity holdings happen a little early and the sharp increase happen a bit late, but largely they managed to increase their equity holdings at very attractive levels. This is one example of rebalancing being a good strategy and that professional asset managers can add value to investors by following rebalancing rules. If rebalancing will be a good strategy going forward depends on if regime changes will occur or not, for instance if a permanent change in the relative valuations of stocks and bonds takes place. The broader the asset classes, the less likely such a regime change is to occur (Ang 2014, p. 141).

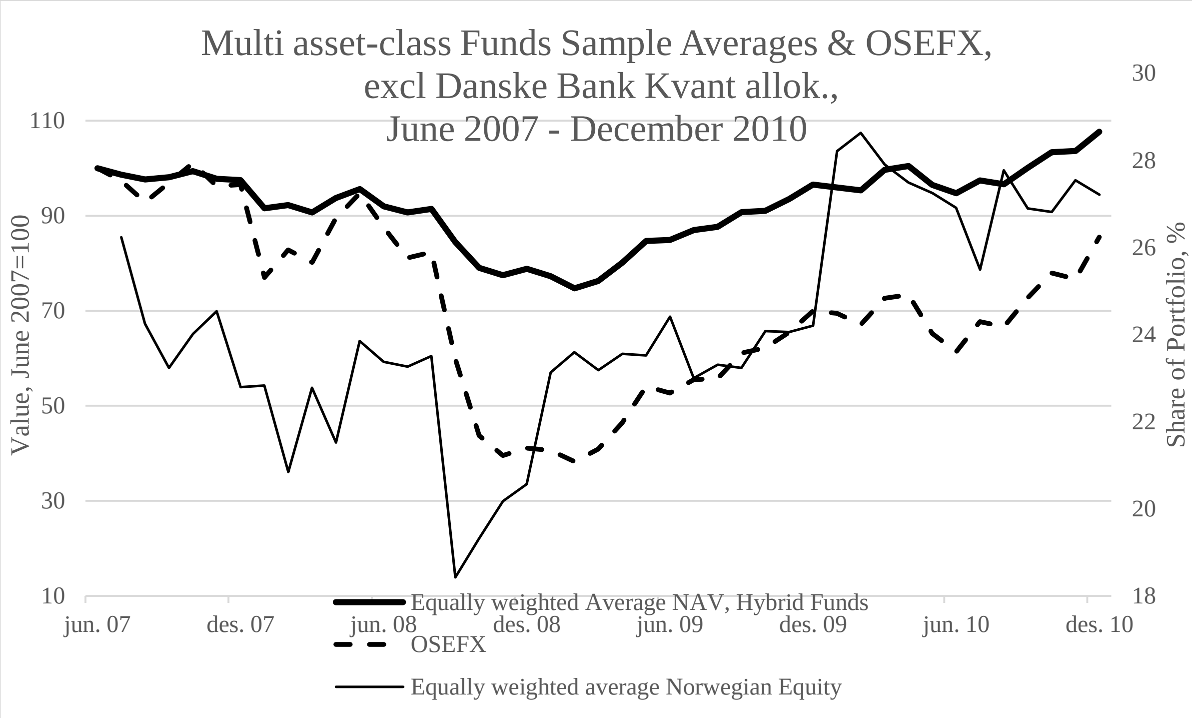


Figure 11: multi asset-class funds sample averages and OSEFX

With our data on portfolio constituents, we have obtained graphs on holdings of Norwegian equity for the individual funds, and we compare these data to the development in value of the OSEFX over time. For time series graphs on OSEFX value and Norwegian equity holdings for the individual funds, see Appendix 10.1.14.

Based on the graphs in Appendix 10.1.14, we have selected some examples of how some funds allocated their capital before and during the financial crisis.

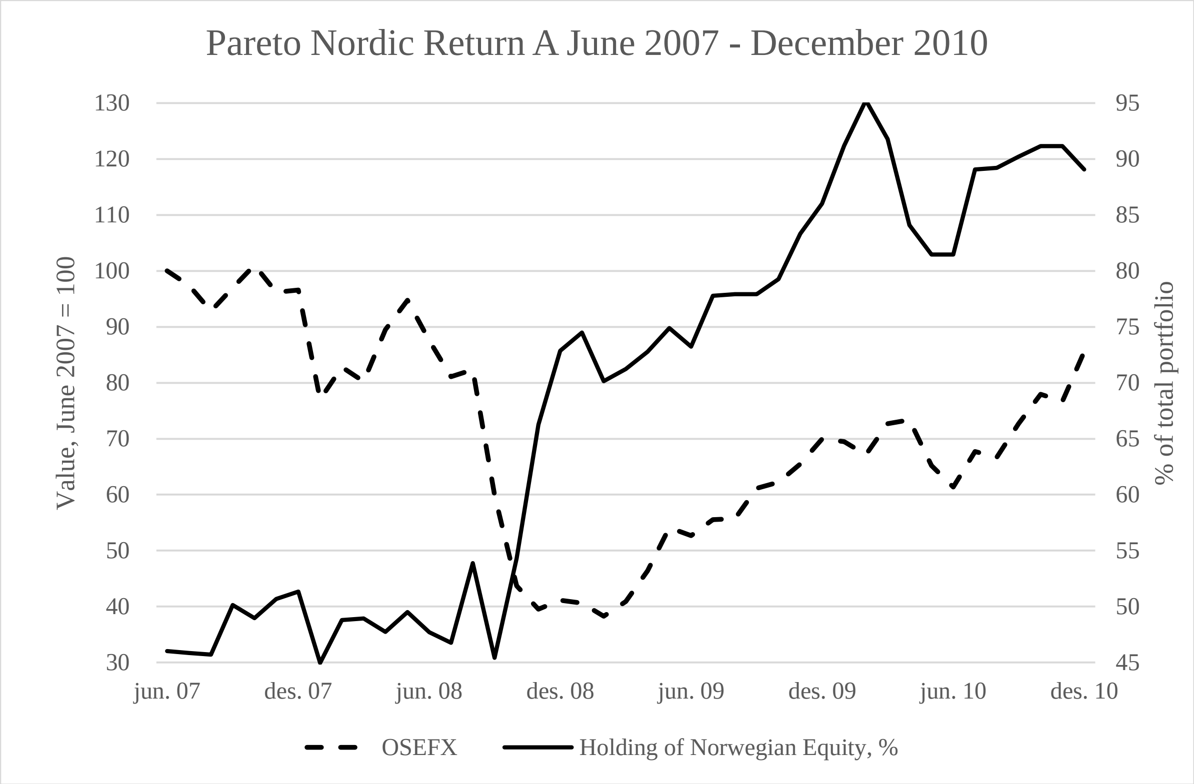


Figure 12: Pareto Nordic Return A Norwegian equity holdings, financial crisis

In figure 12, we present a graph showing Pareto Nordic Return As holding of Norwegian equity. We see how the fund increased its holdings of Norwegian equity from a pre-crises level of around 40% to around 75%. Later, they increased to as much as 95% Norwegian equity.

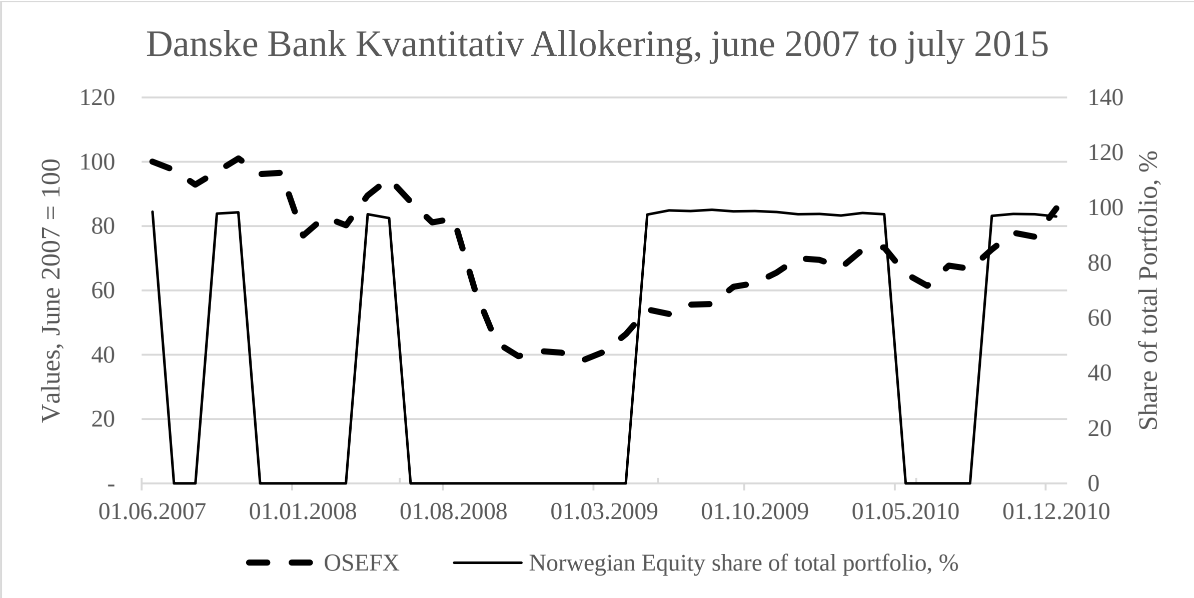


Figure 13: Danske Bank Kvantitativ Allokering Norwegian equity holdings financial crisis

Another fund that succeeded in timing the market during the financial crisis was Danske Invest Kvantitativ Allokering. The graph for the fund's holdings is characteristic, because of their strategy where the entire portfolio is shifted into equities or stocks, depending on the anticipated market developments.

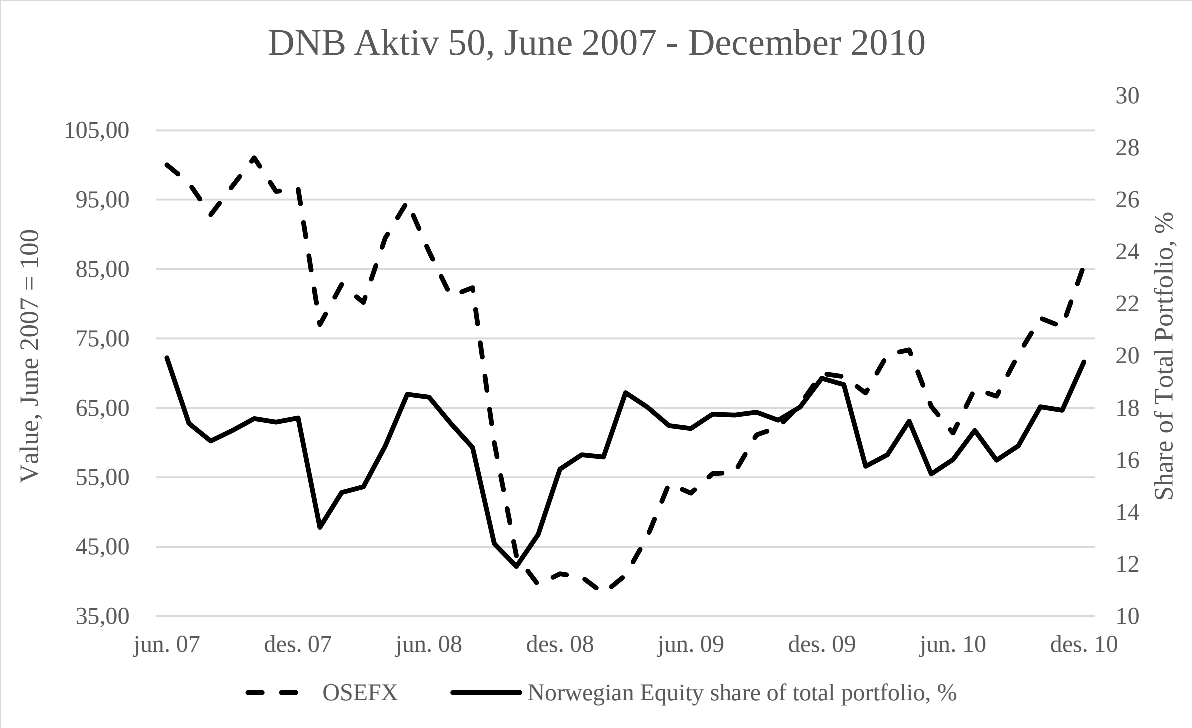


Figure 14: DNB Aktiv 50 Norwegian equity holdings financial crisis

When we turn to DNB Aktiv 50, we see less indication of attempted market timing prior to the crisis. The portfolio holding data confirms the visual impression from the graph, i.e. that the share of equity followed the OSEFX value development. This changed in the period November 2008 to March 2009, when the fund increased its holding of Norwegian equity from 13% to 18,5%. In retrospect, we can see that this was a successful timing decision. The increase was done prior to the recovery, which picked up its pace through March and April of 2009.

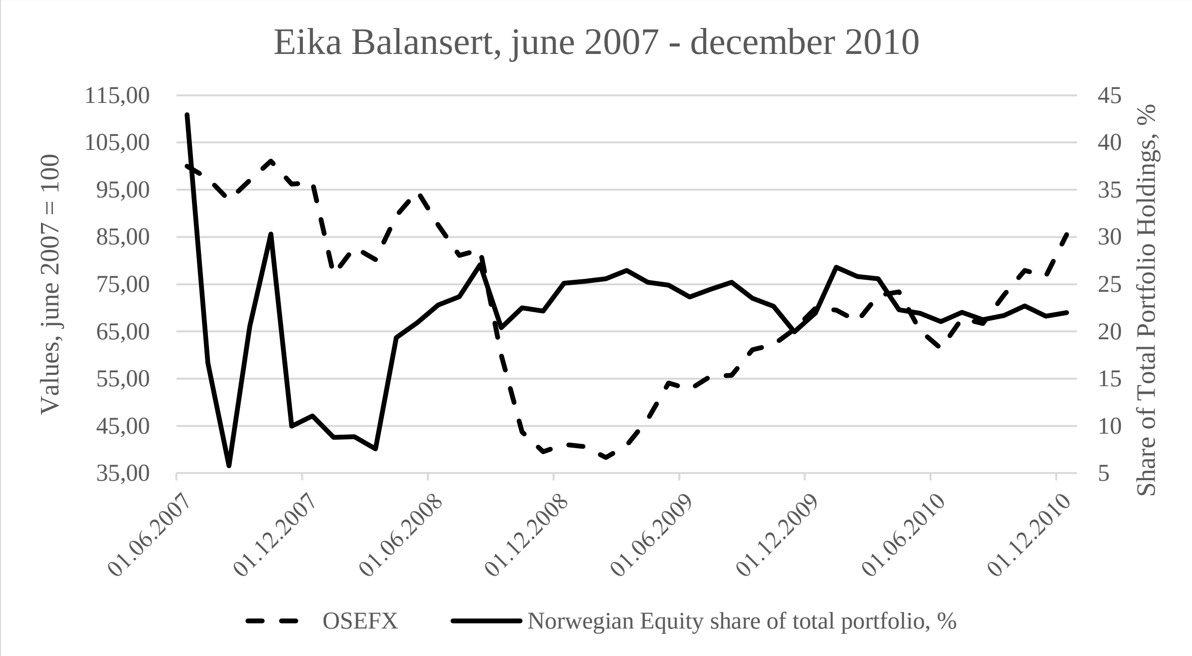


Figure 15: Eika Balansert Norwegian equity holdings financial crisis

Judging from the data in our sample, Eika Balansert was unfavourably positioned when entering the financial crises. The data shows how they increase their holding of Norwegian Equity in April 2008, and they do not increase their holdings before the recovery.

8. Conclusion

Norwegian multi asset-class mutual funds are a growing mutual fund category. The funds are priced at a premium compared to a comparable mix of equity and bond funds, which is partly because of their efforts to time the market. Norwegian multi asset-class funds have not been the subject for much research, and it is not clear if the market timing activities really adds value to the product, and thus justify the higher price.

Therefore, we ask the research question:

Are Norwegian multi asset-class mutual funds able to time the market?

In order to answer this question, we have collected and used an extensive dataset. The dataset contains returns and portfolio holdings for a sample period of 8 years, for 22 Norwegian multi asset-class mutual funds.

The returns based TM and HM method results show that most funds do not have significant timing ability. Some funds, however, separate from the others by being able to time the asset class Norwegian equity. The most notable difference between the HM and TM analysis is that the HM results show that a few funds are also able to time the international equity markets.

Adding more risk-factors to the TM and HM models does not change results very much. However, we see that some more funds have significant timing coefficients on Norwegian equity. For international equities and bonds we see less timing ability using the multi-factor models.

The holding based analysis confirms some of the results from the returns based methods, but overall shows less positive and negative timing skill. The number of statistically significant timing coefficients is no larger than what one would expect from a sample with no timing skill at all.

Our case study of the financial crisis show that multi asset-class funds on average increased their share of Norwegian equity on what ex post turned out to be attractive levels. We believe that rebalancing rules forced managers to load on equity, which we in retrospect see was attractively priced.

Our results are a bit more positive than previous studies with similar methods in other markets; some funds are able to time the market both in the returns based and holdings based analysis. These funds might be able to defend a higher pricing than a comparable mix of equity and bond funds. Nevertheless, the analysis results show that the vast majority of funds do not possess the ability to time the market, and it is therefore questionable if they are able to defend their price premium.

8.1.1 Final remarks

Even though the scope of this study is focused on studying timing ability, the authors would like to emphasize that timing skill is only one out of many criteria the investor should keep in mind when choosing a multi asset-class mutual fund. The authors have been working a lot with data material from multi asset-class funds throughout this study, and we believe that multi asset-class funds are good investment vehicles for the ordinary retail investor because they offer better diversification than owning single stocks or funds with only one asset class in their portfolio. In addition, a multi asset-class fund is likely to practice rebalancing with more discipline than that of an ordinary retail investor. If a reasonably priced fund that did not attempted active market timing but practiced a strict rebalancing rule were started, it would certainly be an interesting product.

8.1.2 Further research

Our study has tried to shed light upon the market timing activities of Norwegian multi asset-class mutual funds. Many questions are still unanswered. A topic for further research could be to use conditional models on Norwegian data to find out if multi asset-class fund managers exploit the information from the predictors of broad market returns. Another question that could inspire future research consider market-timing activities from a somewhat different angle. Let us for now assume that the fund managers' short-term timing activities are not generating value on a regular basis; are the managers able to predict major events like a systematic crisis? If so, are the manager's responses to such events profitable enough to justify continuous market timing attempts? One of the major challenges in the work with this thesis was finding appropriate benchmarks for the bond portfolios, and therefore a study with more emphasis on bond timing would be interesting. Lastly, most of the detected timing ability was found in aggressive funds. To detect timing ability in less aggressive funds, a non-parametric approach could be used (Jiang 2003).

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10. Appendix

10.1.1 Sample subcategories

Norwegian investments only	Fund Sample Number
Alfred Berg Kombi	1
Carnegie Multifond	4
Danske Invest Kvantitativ Allokering	5
Fondsfinans Aktiv 60 40	11
Funds investing internationally	
Norwegian and Nordic investments	
Atlas Absolutt	3
Delphi Kombinasjon	6
Eika Balansert	10
Pareto Nordic Return A	18
Norwegian and global investments	
Alfred Berg Optimal Allokering	2
DNB Aktiv 10	7
DNB Aktiv 50	8
DNB Aktiv 80	9
Nordea Plan 10	12
Nordea Plan 30	13
Nordea Plan 50	14
Nordea Plan 65	15
Nordea Plan 80	16
Nordea Stabil Avkastning	17
Storebrand Kombinasjon	19
Vekterfond Trygg	20
Vekterfond Balansert	21
Vekterfond Offensiv	22

10.1.2 TM model results

	r1	r4	r5	r11	r3	r6	r10	r18	r2	r7	r8	r9	r12	r13	r14	r15	r16	r17	r19	r20	r21	r22
OSEFXReturns	0.307***	0.479***	0.389***	0.759***	0.367***	0.187***	0.226***	0.677***	0.218***	0.0710***	0.203***	0.270***	0.0521***	0.124***	0.199***	0.254***	0.312***	0.0733***	0.237***	0.0944***	0.189***	0.273***
	(19.02)	(25.74)	(4.40)	(23.74)	(6.38)	(3.89)	(5.17)	(10.04)	(4.30)	(3.86)	(14.12)	(12.20)	(5.46)	(9.30)	(10.32)	(11.86)	(13.15)	(3.87)	(14.57)	(9.58)	(12.13)	(12.06)
NorwBondsReturns	-0.00314	0.234**	0.0486	-0.0513	0.0376	0.220	0.00358	-0.224	0.306**	0.177***	0.0738	0.0535	0.206***	0.217***	0.234***	0.176*	0.124	0.599***	0.00944	0.429***	0.272***	0.111
	(-0.04)	(2.21)	(0.09)	(-0.25)	(0.14)	(1.43)	(0.03)	(-0.78)	(2.06)	(2.79)	(0.94)	(0.46)	(4.67)	(3.47)	(2.71)	(1.71)	(1.08)	(4.57)	(0.10)	(10.50)	(4.03)	(1.03)
OSEFXReturns2	0.0522	0.230	1.360***	0.117	0.837***	0.0734	0.167	0.959***	0.0945	-0.0556	-0.0184	0.130	0.00476	0.0345	0.0508	0.0745	0.0940	-0.0961	0.0791	-0.0707*	-0.0109	0.0409
	(0.68)	(1.13)	(3.33)	(0.48)	(4.73)	(0.49)	(0.91)	(3.10)	(0.51)	(-0.48)	(-0.32)	(1.50)	(0.09)	(0.43)	(0.44)	(0.61)	(0.72)	(-1.51)	(0.87)	(-1.84)	(-0.20)	(0.51)
NorwBondsReturns2	2.728	1.659	-89.56	-51.08***	7.139	-0.944	21.72	-26.16	9.626	2.454	0.807	-7.662	-3.175	-9.327	-16.41*	-19.98*	-23.98**	4.030	-4.948	8.576*	3.819	0.601
	(0.27)	(0.15)	(-1.61)	(-2.67)	(0.28)	(-0.06)	(1.58)	(-1.13)	(0.65)	(0.42)	(0.13)	(-0.76)	(-0.83)	(-1.62)	(-1.97)	(-1.98)	(-2.14)	(0.33)	(-0.51)	(1.71)	(0.48)	(0.05)
MSCINordicReturns					0.210***	0.245***	0.269***	0.0984														
					(3.18)	(5.11)	(7.07)	(1.08)														
NordicCorpBondReturns					-0.348***	-0.0792	-0.0230	-0.00822														
					(-3.18)	(-0.67)	(-0.40)	(-0.09)														
MSCINordicReturns2					-1.718***	0.132	0.0362	-0.713														
					(-4.71)	(0.55)	(0.25)	(-0.93)														
NordicCorpBondReturns2					2.958**	-3.399	1.561**	4.234***														
					(2.25)	(-1.35)	(2.27)	(2.71)														
MSCIWorldReturns									0.390***	0.0101	0.349***	0.473***	0.0783***	0.206***	0.322***	0.413***	0.501***	0.394***	0.337***	0.121***	0.317***	0.481***
									(6.23)	(0.35)	(13.45)	(12.14)	(5.57)	(10.43)	(11.72)	(12.88)	(13.53)	(10.74)	(12.22)	(9.75)	(14.19)	(14.17)
GlobCorpReturns									-0.0797	0.0253	0.0250	0.0155	0.00114	0.0131	0.0289	0.0429	0.0591	-0.245***		0.0174	0.0506*	0.0833**
									(-1.28)	(0.95)	(1.15)	(0.41)	(0.07)	(0.58)	(0.91)	(1.17)	(1.46)	(-5.72)		(1.05)	(1.88)	(2.11)
MSCIWorldReturns2									-0.797	0.465	0.555	0.829	0.240	0.268	0.255	0.219	0.295	0.0583	0.121	0.275	0.377	0.376
									(-0.96)	(0.87)	(1.33)	(1.40)	(1.17)	(1.08)	(0.76)	(0.58)	(0.69)	(0.14)	(0.28)	(1.60)	(1.44)	(0.95)
GlobCorpReturns2									-0.800	0.351	-0.0234	-0.0322	0.0387	0.161	0.257	0.301	0.307	0.0451		-0.413**	-0.532	-0.712
									(-1.32)	(0.83)	(-0.09)	(-0.07)	(0.19)	(0.55)	(0.62)	(0.65)	(0.59)	(0.07)		(-2.29)	(-1.51)	(-1.34)
Constant	0.00304**	-0.000532	0.00193	0.00265	-0.00141	0.00319**	-0.00155	0.00453*	-0.000511	-0.000542	-0.000969	-0.000627	-0.000152	-0.000350	-0.000325	-0.000464	-0.000614	-0.000423	-0.000288	-0.000395	-0.000842	-0.00104
	(2.45)	(-0.55)	(0.48)	(1.31)	(-0.47)	(2.05)	(-0.94)	(1.80)	(-0.25)	(-0.63)	(-1.40)	(-0.53)	(-0.32)	(-0.45)	(-0.29)	(-0.34)	(-0.39)	(-0.29)	(-0.25)	(-0.73)	(-1.00)	(-0.79)
R^2	0.896	0.944	0.413	0.926	0.775	0.793	0.887	0.882	0.874	0.522	0.968	0.949	0.823	0.927	0.942	0.950	0.956	0.856	0.931	0.938	0.956	0.954
Observations	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96

TM models Regression results
t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

10.1.3 HM model results

HM models Regression results

	hm1	hm4	hm5	hm11	hm3	hm6	hm10	hm18	hm2	hm7	hm8	hm9	hm12	hm13	hm14	hm15	hm16	hm17	hm19	hm20	hm21	hm22
OSEFXReturns	0.303***	0.433***	0.0472	0.734***	0.231***	0.177***	0.217***	0.563***	q0.205***	0.0941***	0.214***	0.251***	0.0523***	0.118***	0.190***	0.240***	0.294***	0.0975***	0.223***	0.114***	0.198***	0.275***
	(19.49)	(8.25)	(0.84)	(12.59)	(2.94)	(2.77)	(4.53)	(7.28)	(8.10)	(3.46)	(13.49)	(12.14)	(4.22)	(5.83)	(6.54)	(7.44)	(8.47)	(4.77)	(8.83)	(9.35)	(16.58)	(12.76)
NorwBondsReturns	-0.0794	0.225	1.555	0.573	-0.199	-0.0145	-0.349	0.207	-0.0379	0.161	0.0413	0.246	0.219**	0.338***	0.471***	0.476**	0.494**	0.447	0.0644	0.314***	0.262*	0.180
	(-0.46)	(0.92)	(1.28)	(1.27)	(-0.33)	(-0.06)	(-1.38)	(0.32)	(-0.14)	(1.22)	(0.29)	(1.20)	(2.55)	(2.90)	(3.04)	(2.59)	(2.37)	(1.65)	(0.32)	(3.67)	(1.83)	(0.80)
HM_OSEFX	-0.00230	0.0685	0.577***	0.0390	0.240**	-0.00767	0.0100	0.200*	-0.00704	-0.0445	-0.0243	0.0112	-0.000526	0.00579	0.00679	0.0121	0.0166	-0.0374	0.0175	-0.0286*	-0.0214	-0.0202
	(-0.07)	(0.96)	(3.28)	(0.43)	(2.32)	(-0.09)	(0.14)	(1.97)	(-0.09)	(-1.08)	(-1.04)	(0.31)	(-0.03)	(0.20)	(0.17)	(0.27)	(0.35)	(-1.09)	(0.48)	(-1.81)	(-0.84)	(-0.51)
HM_NorwBonds	0.135	0.0136	-2.974*	-1.301*	0.438	0.373	0.680	-0.893	0.684	0.0343	0.0604	-0.341	-0.0369	-0.244	-0.466*	-0.582*	-0.716*	0.272	-0.116	0.233	0.0507	-0.0787
	(0.41)	(0.03)	(-1.71)	(-1.77)	(0.49)	(0.63)	(1.45)	(-0.92)	(1.39)	(0.16)	(0.30)	(-1.03)	(-0.28)	(-1.28)	(-1.72)	(-1.80)	(-1.97)	(0.70)	(-0.36)	(1.46)	(0.22)	(-0.22)
MSCINordicReturns					0.375***	0.240**	0.224***	0.0163														
					(3.15)	(2.62)	(3.95)	(0.14)														
NordicCorpBondReturns					-0.520***	0.0546	-0.104	-0.163														
					(-3.07)	(0.37)	(-0.94)	(-0.75)														
HM_MSCINordic					-0.396*	0.0387	0.0737	0.0754														
					(-1.89)	(0.34)	(1.11)	(0.49)														
HM_NordicCorpBond					0.386	-0.280	0.178	0.419														
					(1.65)	(-0.93)	(1.36)	(1.44)														
MSCIWorldReturns									0.435***	-0.0356	0.297***	0.381***	0.0590***	0.180***	0.293***	0.382***	0.459***	0.390***	0.315***	0.0893***	0.262***	0.414***
									(4.96)	(-0.70)	(6.09)	(6.54)	(3.23)	(7.49)	(8.90)	(10.06)	(10.23)	(7.18)	(7.51)	(5.74)	(8.41)	(8.55)
GlobCorpReturns									-0.0859	-0.00337	0.0230	-0.00772	0.00199	-0.00144	0.000165	0.00467	0.0155	-0.265***		0.0464**	0.0716*	0.0987
									(-1.02)	(-0.09)	(0.71)	(-0.15)	(0.09)	(-0.05)	(0.00)	(0.11)	(0.31)	(-3.92)		(2.02)	(1.70)	(1.61)
HM_MSCIWorld									-0.0285	0.0754	0.0925	0.190**	0.0322	0.0491	0.0630	0.0727	0.0986	0.00226	0.0454	0.0533*	0.113**	0.152**
									(-0.23)	(1.10)	(1.49)	(2.03)	(1.03)	(1.18)	(1.10)	(1.12)	(1.33)	(0.03)	(0.59)	(1.88)	(2.45)	(2.17)
HM_GlobCorp									-0.0484	0.0600	0.00223	0.0270	-0.00102	0.0248	0.0474	0.0609	0.0678	0.0370		-0.0542*	-0.0530	-0.0578
									(-0.56)	(1.09)	(0.06)	(0.37)	(-0.03)	(0.57)	(0.77)	(0.86)	(0.86)	(0.42)		(-1.78)	(-0.95)	(-0.70)
Constant	0.00312*	-0.000955	-0.00108	0.00348	-0.00282	0.00292	-0.00374	0.00112	-0.00245	-0.000537	-0.00123	-0.00171	-0.000236	-0.000568	-0.000626	-0.000953	-0.00130	-0.000975	-0.000718	-0.000460	-0.00141	-0.00194
	(1.80)	(-0.66)	(-0.19)	(1.17)	(-0.60)	(1.27)	(-1.32)	(0.24)	(-0.90)	(-0.45)	(-1.15)	(-0.89)	(-0.34)	(-0.48)	(-0.37)	(-0.47)	(-0.56)	(-0.48)	(-0.42)	(-0.55)	(-1.20)	(-1.07)
R^2	0.895	0.941	0.403	0.924	0.752	0.784	0.886	0.867	0.873	0.532	0.968	0.948	0.819	0.926	0.941	0.950	0.956	0.856	0.930	0.934	0.956	0.955
Observations	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

10.1.4 Multi-factor TM results

TM analysis with FF factors

	r4	r5	r11	r1	r3	r6	r10	r18	r2	r7	r8	r9	r12	r13	r14	r15	r16	r17	r19	r20	r21	r22
HML	-0.00719	0.0562	-0.0185	-0.0254	0.0425	0.0305	0.0259	-0.145***	-0.00977	0.00666	0.00106	-0.0164	0.00333	0.00417	0.00744	0.00587	0.00335	0.00995	0.00271	-0.0107	-0.0243	-0.0342
	(-0.25)	(0.67)	(-0.42)	(-1.15)	(0.69)	(0.61)	(1.10)	(-2.94)	(-0.24)	(0.37)	(0.07)	(-0.54)	(0.40)	(0.34)	(0.42)	(0.31)	(0.16)	(0.51)	(0.13)	(-1.26)	(-1.54)	(-1.48)
SMB	-0.0499**	0.0807	0.177***	0.0133	0.202***	0.0780*	0.0764***	0.0991	0.115**	0.0224	0.0400***	0.0714***	0.0172**	0.0261**	0.0386**	0.0459**	0.0542**	0.00454	0.0395**	0.00309	0.0131	0.0260
	(-2.25)	(0.91)	(3.44)	(0.49)	(2.97)	(1.72)	(2.93)	(1.65)	(2.37)	(1.38)	(2.72)	(2.99)	(2.33)	(2.29)	(2.46)	(2.51)	(2.59)	(0.14)	(2.40)	(0.31)	(0.93)	(1.26)
exGvmnt5y	0.0172	-0.205	-0.338*	-0.0938	-0.238	0.0606	-0.150	-0.231	-0.161	0.0100	-0.108	-0.174*	-0.0428	-0.0535	-0.0474	-0.0645	-0.0722	-0.259*	-0.313***	-0.125**	-0.231***	-0.306***
	(0.15)	(-0.42)	(-1.97)	(-0.63)	(-0.82)	(0.42)	(-1.19)	(-0.95)	(-0.85)	(0.13)	(-1.48)	(-1.79)	(-1.13)	(-1.09)	(-0.71)	(-0.83)	(-0.80)	(-1.80)	(-3.51)	(-2.60)	(-3.82)	(-3.68)
OSEFXReturns	0.470***	0.405***	0.771***	0.299***	0.470***	0.186***	0.255***	0.619***	0.245***	0.0754***	0.202***	0.271***	0.0546***	0.128***	0.206***	0.261***	0.319***	0.0729**	0.219***	0.0859***	0.174***	0.255***
	(22.32)	(4.09)	(22.39)	(14.62)	(5.77)	(3.39)	(5.39)	(7.87)	(4.56)	(3.30)	(12.45)	(11.38)	(5.37)	(9.36)	(10.58)	(12.05)	(13.18)	(2.62)	(14.75)	(8.60)	(11.83)	(11.48)
NorwBondsReturns	0.219	0.277	0.226	0.0621	0.198	0.148	0.128	-0.0699	0.392	0.181**	0.183**	0.206	0.244***	0.265***	0.279***	0.239**	0.194	0.796***	0.342***	0.537***	0.466***	0.365***
	(1.50)	(0.35)	(1.00)	(0.36)	(0.55)	(0.92)	(0.71)	(-0.23)	(1.42)	(2.14)	(2.03)	(1.52)	(4.21)	(3.60)	(2.79)	(2.02)	(1.45)	(4.69)	(2.82)	(6.70)	(5.29)	(3.11)
OSEFXReturns2	0.230	1.353***	0.101	0.0460	0.910***	0.108	0.215	1.119***	0.126	-0.0115	0.0278	0.196**	0.0192	0.0623	0.0965	0.131	0.164	-0.171**	0.182**	-0.0756**	-0.00364	0.0597
	(1.11)	(3.30)	(0.42)	(0.62)	(4.69)	(0.79)	(1.34)	(4.01)	(0.73)	(-0.10)	(0.51)	(2.27)	(0.38)	(0.81)	(0.87)	(1.12)	(1.31)	(-2.17)	(2.15)	(-2.10)	(-0.07)	(0.79)
NorwBondsReturns2	1.148	-86.20	-47.29***	3.243	6.662	-9.581	21.21	-24.96	9.522	2.529	0.422	-8.333	-2.909	-8.794	-15.83*	-19.42*	-23.48**	6.616	-4.960	9.176*	5.396	2.596
	(0.11)	(-1.58)	(-2.73)	(0.29)	(0.34)	(-0.60)	(1.39)	(-1.00)	(0.60)	(0.41)	(0.08)	(-0.92)	(-0.66)	(-1.38)	(-1.76)	(-1.82)	(-2.00)	(0.63)	(-0.51)	(1.69)	(0.73)	(0.24)
MSCINordicReturns					0.139*	0.244***	0.250***	0.135*														
					(1.67)	(4.63)	(6.45)	(1.68)														
NordicCorpBondReturns					-0.190	-0.00418	0.0438	-0.0579														
					(-1.55)	(-0.04)	(0.71)	(-0.57)														
HMLNordic					-0.0761	0.0328	-0.0391	-0.176***														
					(-0.87)	(0.64)	(-1.22)	(-3.19)														
SMBNordic					-0.00610	0.154***	0.0310	0.142*														
					(-0.06)	(3.07)	(0.68)	(1.70)														
MSCINordicReturns2					-1.739***	-0.0907	-0.0317	-0.895														
					(-4.08)	(-0.37)	(-0.24)	(-1.31)														
NordicCorpBondReturns2					2.810*	-3.840*	1.490*	2.785*														
					(1.85)	(-1.84)	(1.80)	(1.98)														
MSCIWorldReturns									0.374***	0.0249	0.355***	0.476***	0.0825***	0.216***	0.339***	0.432***	0.523***	0.380***	0.357***	0.121***	0.326***	0.497***
									(5.96)	(0.94)	(13.71)	(10.64)	(5.53)	(10.28)	(11.78)	(13.23)	(14.08)	(8.20)	(13.80)	(9.36)	(12.61)	(12.40)
GlobCorpReturns									-0.0578	0.0198	0.0258	0.0191	0.00216	0.0125	0.0269	0.0401	0.0549	-0.225***		0.0193	0.0502*	0.0818**
									(-1.00)	(0.75)	(1.29)	(0.52)	(0.14)	(0.57)	(0.89)	(1.16)	(1.45)	(-4.79)		(1.22)	(1.90)	(2.07)
globalSMB									-0.0556	-0.0284	0.0192	0.0159	-0.0141	-0.0337	-0.0506	-0.0524	-0.0568	-0.0305	0.0566	0.00916	-0.0199	-0.0376
									(-0.59)	(-0.69)	(0.82)	(0.38)	(-0.71)	(-1.13)	(-1.21)	(-1.07)	(-1.04)	(-0.55)	(1.46)	(0.45)	(-0.65)	(-0.82)
globalHML									-0.0597	-0.0812	-0.0797**	-0.118	-0.0302	-0.0594*	-0.0931*	-0.114**	-0.139**	0.106	-0.173***	-0.00289	-0.0454	-0.0815
									(-0.81)	(-1.54)	(-2.07)	(-1.64)	(-1.15)	(-1.78)	(-1.99)	(-2.08)	(-2.21)	(1.62)	(-3.49)	(-0.14)	(-1.13)	(-1.36)
MSCIWorldReturns2									-1.146	0.309	0.259	0.376	0.163	0.151	0.0736	-0.0173	-0.00165	0.290	-0.467	0.241	0.291	0.229
									(-1.38)	(0.64)	(0.66)	(0.67)	(0.77)	(0.60)	(0.21)	(-0.04)	(-0.00)	(0.51)	(-1.29)	(1.42)	(1.34)	(0.66)
GlobCorpReturns2									-0.463	0.385	0.129	0.248	0.0872	0.230	0.346	0.420	0.456	0.0858		-0.338*	-0.380	-0.478
									(-0.78)	(0.94)	(0.68)	(0.60)	(0.44)	(0.83)	(0.90)	(1.01)	(1.00)	(0.14)		(-1.87)	(-1.17)	(-0.96)
Constant	-0.000833	0.00219	0.00379*	0.00320***	-0.000562	0.00437***	-0.00127	0.00539**	0.000266	-0.000684	-0.000980	-0.000496	-0.000150	-0.000402	-0.000408	-0.000574	-0.000751	-0.000101	-0.000434	-0.000429	-0.00100	-0.00126
	(-0.85)	(0.55)	(1.98)	(2.64)	(-0.22)	(2.65)	(-0.73)	(2.33)	(0.15)	(-0.78)	(-1.49)	(-0.46)	(-0.30)	(-0.49)	(-0.35)	(-0.41)	(-0.47)	(-0.07)	(-0.44)	(-0.88)	(-1.22)	(-0.96)
R^2	0.947	0.422	0.943	0.899	0.808	0.836	0.900	0.914	0.895	0.556	0.975	0.961	0.836	0.934	0.948	0.956	0.961	0.870	0.950	0.946	0.964	0.961
Observations	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

10.1.5 Multi-factor HM results

HM analysis with FF factors

	HM4	HM5	HM11	HM1	HM3	HM6	HM10	HM18	HM2	HM7	HM8	HM9	HM12	HM13	HM14	HM15	HM16	HM17	HM19	HM20	HM21	HM22
HML	-0.00687	0.0619	-0.0176	-0.0256	0.0328	0.0352	0.0247	-0.148**	-0.0143	0.00714	0.00124	-0.0158	0.00390	0.00530	0.00899	0.00763	0.00542	0.0107	0.00248	-0.0119	-0.0260*	-0.0371
	(-0.24)	(0.77)	(-0.40)	(-1.13)	(0.49)	(0.68)	(0.98)	(-2.57)	(-0.36)	(0.39)	(0.09)	(-0.56)	(0.46)	(0.43)	(0.51)	(0.40)	(0.26)	(0.51)	(0.12)	(-1.35)	(-1.67)	(-1.61)
SMB	-0.0473**	0.119	0.184***	0.0125	0.200***	0.0823*	0.0779***	0.120*	0.113**	0.0226	0.0406***	0.0752***	0.0180**	0.0285**	0.0424**	0.0506**	0.0599***	0.00260	0.0389**	0.000188	0.0104	0.0232
	(-2.05)	(1.27)	(3.60)	(0.46)	(2.79)	(1.68)	(2.80)	(1.88)	(2.34)	(1.28)	(2.71)	(3.00)	(2.25)	(2.30)	(2.47)	(2.54)	(2.65)	(0.08)	(2.16)	(0.02)	(0.71)	(1.08)
exGvmnt5y	0.00642	-0.183	-0.341**	-0.103	-0.244	-0.0205	-0.113	-0.140	-0.174	0.0141	-0.106	-0.167*	-0.0428	-0.0518	-0.0444	-0.0602	-0.0666	-0.262*	-0.311***	-0.128**	-0.231***	-0.306***
	(0.05)	(-0.36)	(-2.02)	(-0.69)	(-0.77)	(-0.15)	(-0.89)	(-0.52)	(-0.90)	(0.18)	(-1.44)	(-1.70)	(-1.14)	(-1.06)	(-0.67)	(-0.78)	(-0.74)	(-1.83)	(-3.47)	(-2.34)	(-3.56)	(-3.53)
OSEFXReturns	0.425***	0.0696	0.744***	0.296***	0.323***	0.171**	0.240***	0.486***	0.223***	0.0889***	0.201***	0.238***	0.0505***	0.116***	0.187***	0.234***	0.286***	0.115***	0.165***	0.104***	0.182***	0.253***
	(8.17)	(1.17)	(12.81)	(15.98)	(2.83)	(2.60)	(4.54)	(4.68)	(5.81)	(3.26)	(12.01)	(9.97)	(4.15)	(6.17)	(7.10)	(7.93)	(8.91)	(3.30)	(7.79)	(8.24)	(12.03)	(9.12)
NorwBondsReturns	0.197	1.782	0.911**	-0.00615	0.0819	0.234	-0.183	0.402	0.129	0.183	0.207*	0.477**	0.271***	0.403***	0.542***	0.571***	0.608**	0.581**	0.483**	0.422***	0.445***	0.424**
	(0.78)	(1.40)	(2.34)	(-0.02)	(0.14)	(0.88)	(-0.53)	(0.72)	(0.32)	(1.26)	(1.80)	(2.57)	(2.76)	(3.06)	(3.02)	(2.72)	(2.60)	(2.45)	(2.29)	(2.85)	(2.70)	(2.09)
HM_OSEFX	0.0637	0.587***	0.0500	-0.00419	0.268**	0.0166	0.0312	0.274**	0.0136	-0.0267	-0.00101	0.0435	0.00743	0.0195	0.0285	0.0387	0.0493	-0.0669	0.0590*	-0.0292*	-0.0181	-0.0119
	(0.88)	(3.21)	(0.56)	(-0.13)	(2.53)	(0.24)	(0.46)	(2.29)	(0.20)	(-0.65)	(-0.04)	(1.25)	(0.38)	(0.68)	(0.70)	(0.89)	(1.05)	(-1.66)	(1.71)	(-1.91)	(-0.78)	(-0.32)
HM_NorwBonds	0.0505	-2.987*	-1.376**	0.138	0.231	-0.0832	0.545	-1.125	0.535	-0.0129	-0.0473	-0.517	-0.0614	-0.278	-0.523*	-0.658*	-0.816**	0.401	-0.186	0.241	0.0677	-0.0750
	(0.14)	(-1.72)	(-2.21)	(0.40)	(0.30)	(-0.15)	(1.02)	(-1.37)	(1.03)	(-0.05)	(-0.26)	(-1.61)	(-0.42)	(-1.32)	(-1.77)	(-1.88)	(-2.10)	(1.17)	(-0.57)	(1.38)	(0.29)	(-0.22)
MSCINordicReturns					0.284*	0.263***	0.206***	0.0572														
					(1.93)	(2.89)	(3.35)	(0.43)														
NordicCorpBondReturns					-0.316*	0.157	-0.0127	-0.0880														
					(-1.71)	(0.97)	(-0.11)	(-0.52)														
HMLNordic					-0.0585	0.0509	-0.0315	-0.148***														
					(-0.65)	(1.02)	(-0.95)	(-2.76)														
SMBNordic					-0.0262	0.138***	0.0229	0.108														
					(-0.25)	(2.95)	(0.47)	(1.31)														
HM_MSCINordic					-0.376	-0.0329	0.0632	0.0321														
					(-1.66)	(-0.30)	(0.89)	(0.13)														
HM_NordicCorpBond					0.309	-0.304	0.140	0.215														
					(1.15)	(-1.11)	(0.98)	(0.90)														
MSCIWorldReturns									0.452***	-0.00737	0.331***	0.424***	0.0721***	0.203***	0.328***	0.425***	0.511***	0.353***	0.412***	0.0944***	0.279***	0.442***
									(4.76)	(-0.14)	(7.09)	(6.51)	(3.36)	(7.60)	(9.35)	(10.49)	(10.91)	(4.54)	(10.54)	(5.09)	(8.16)	(8.15)
GlobCorpReturns									-0.0830	-0.0101	0.0164	-0.0138	0.0000607	-0.00526	-0.00623	-0.00327	0.00540	-0.248***	-0.0347	0.0467**	0.0712*	0.0965*
									(-0.97)	(-0.28)	(0.60)	(-0.30)	(0.00)	(-0.20)	(-0.17)	(-0.08)	(0.12)	(-3.42)	(-0.81)	(2.22)	(1.90)	(1.74)
globalHML									-0.0406	-0.0688	-0.0725*	-0.0931	-0.0294	-0.0545*	-0.0847*	-0.102**	-0.125**	0.0995	-0.171***	-0.00573	-0.0360	-0.0608
									(-0.51)	(-1.46)	(-1.95)	(-1.37)	(-1.17)	(-1.73)	(-1.97)	(-2.06)	(-2.21)	(1.50)	(-3.47)	(-0.26)	(-0.88)	(-1.01)
globalSMB									-0.0650	-0.0280	0.0203	0.0152	-0.0133	-0.0340	-0.0522	-0.0553	-0.0602	-0.0295	0.0553	0.0119	-0.0186	-0.0379
									(-0.68)	(-0.66)	(0.87)	(0.34)	(-0.66)	(-1.09)	(-1.20)	(-1.09)	(-1.06)	(-0.54)	(1.31)	(0.58)	(-0.62)	(-0.83)
HM_MSCIWorld									-0.0996	0.0479	0.0372	0.105	0.0156	0.0237	0.0251	0.0244	0.0380	0.0417	-0.0451	0.0436	0.0906**	0.117*
									(-0.80)	(0.71)	(0.65)	(1.16)	(0.45)	(0.53)	(0.41)	(0.35)	(0.47)	(0.47)	(-0.70)	(1.48)	(2.01)	(1.67)
HM_GlobCorp									0.00375	0.0662	0.0222	0.0617	0.00648	0.0353	0.0620	0.0790	0.0893	0.0446	0.00293	-0.0509*	-0.0462	-0.0438
									(0.04)	(1.20)	(0.64)	(0.92)	(0.22)	(0.82)	(1.02)	(1.14)	(1.15)	(0.52)	(0.05)	(-1.76)	(-0.90)	(-0.57)
Constant	-0.00125	-0.000644	0.00470	0.00331*	-0.00150	0.00533**	-0.00306	0.00326	-0.00123	-0.000560	-0.000944	-0.000937	-0.000172	-0.000501	-0.000537	-0.000813	-0.00110	-0.000898	-0.000831	-0.000386	-0.00126	-0.00169
	(-0.88)	(-0.12)	(1.65)	(1.95)	(-0.35)	(2.17)	(-0.97)	(0.84)	(-0.47)	(-0.44)	(-0.91)	(-0.53)	(-0.23)	(-0.40)	(-0.30)	(-0.38)	(-0.45)	(-0.43)	(-0.49)	(-0.51)	(-1.15)	(-0.96)
R^2	0.944	0.419	0.942	0.899	0.782	0.826	0.897	0.897	0.893	0.559	0.975	0.960	0.833	0.932	0.947	0.955	0.961	0.870	0.950	0.943	0.964	0.962
Observations	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

10.1.6 Holdings based method results

Norwegian equity 1 month horizon	t4	t5	t11	t1	t3	t6	t10	t18	t2	t7	t8	t9	t12	t13	t14	t15	t16	t17	t19	t20	t21	t22
exOSEFXt	6.473	101.4	-19.73	1.791	9.154	-1.315	1.375	0.838	3.128	-0.720	2.222	3.424	-1.975	-5.888	-9.999	-11.89	-14.13	-1.326	-1.172	-0.673	-1.582	-6.326
	(1.14)	(1.99)	(-3.85)	(0.75)	(0.97)	(-0.39)	(0.23)	(0.11)	(0.89)	(-0.31)	(0.93)	(1.19)	(-1.38)	(-1.46)	(-1.53)	(-1.38)	(-1.32)	(-1.15)	(-0.56)	(-1.44)	(-0.92)	(-2.32)
Constant	0.0507	-0.233	-0.334	-0.0379	0.212	-0.154	-0.265	-0.238	0.118	-0.0893	-0.124	-0.144	0.0351	0.0816	0.137	0.172	0.202	0.0448	-0.0755	-0.00582	-0.0139	-0.0105
	(0.16)	(-0.06)	(-1.11)	(-0.17)	(0.26)	(-0.55)	(-0.57)	(-0.55)	(0.47)	(-0.53)	(-0.91)	(-0.71)	(0.48)	(0.68)	(0.77)	(0.82)	(0.80)	(1.43)	(-0.43)	(-0.14)	(-0.12)	(-0.03)
R^2	0.022	0.031	0.179	0.003	0.007	0.001	0.000	0.000	0.008	0.001	0.014	0.015	0.038	0.123	0.157	0.161	0.162	0.095	0.002	0.013	0.009	0.017
Observations	96	96	96	95	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96

t statistics in parentheses

Norwegian equity 3 month horizon	a4	a5	a11	a1	a3	a6	a10	a18	a2	a7	a8	a9	a12	a13	a14	a15	a16	a17	a19	a20	a21	a22
Q.exOSEFXReturns	1.009	27.37	-4.783	0.136	-2.559	1.185	-1.776	-0.764	2.052	-0.756	1.303	3.184	-0.0856	-1.287	-2.497	-2.970	-4.056	-0.434	0.708	-0.282	-0.582	-0.972
	(0.41)	(0.87)	(-2.25)	(0.14)	(-0.56)	(0.73)	(-0.57)	(-0.23)	(1.44)	(-1.08)	(1.42)	(3.09)	(-0.13)	(-0.82)	(-0.98)	(-0.91)	(-1.01)	(-1.02)	(0.87)	(-1.27)	(-0.65)	(-0.92)
Constant	0.0453	-0.308	-0.335	-0.00651	0.278	-0.150	-0.247	-0.227	0.0927	-0.0847	-0.142	-0.181	0.0318	0.0872	0.141	0.179	0.224	0.0457	-0.0741	-0.00510	-0.0136	-0.0184
	(0.14)	(-0.07)	(-1.02)	(-0.03)	(0.33)	(-0.51)	(-0.51)	(-0.52)	(0.37)	(-0.49)	(-1.01)	(-0.90)	(0.42)	(0.66)	(0.70)	(0.74)	(0.78)	(1.33)	(-0.42)	(-0.12)	(-0.11)	(-0.05)
R^2	0.002	0.009	0.040	0.000	0.002	0.003	0.003	0.001	0.013	0.004	0.018	0.050	0.000	0.022	0.037	0.038	0.050	0.038	0.003	0.008	0.005	0.002
Observations	94	94	94	93	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94

t statistics in parentheses

Norwegian equity 6 month horizon	aa4	aa5	aa11	aa1	aa3	aa6	aa10	aa18	aa2	aa7	aa8	aa9	aa12	aa13	aa14	aa15	aa16	aa17	aa19	aa20	aa21	aa22
6mndR.OSEFX	1.973	8.353	-0.428	-0.164	-7.835	0.620	-1.045	1.290	1.593	-0.658	0.548	0.831	0.0508	-0.472	-0.970	-1.308	-1.799	-0.224	-0.868	-0.147	-0.290	-0.910
	(1.20)	(0.34)	(-0.21)	(-0.21)	(-1.16)	(0.61)	(-0.37)	(0.60)	(1.38)	(-1.52)	(0.74)	(0.96)	(0.13)	(-0.56)	(-0.72)	(-0.78)	(-0.88)	(-1.04)	(-1.12)	(-0.72)	(-0.46)	(-0.43)
Constant	-0.00143	-0.213	-0.378	-0.00371	0.495	-0.146	-0.213	-0.218	0.116	-0.0704	-0.123	-0.149	0.0442	0.101	0.149	0.201	0.248	0.0447	-0.0674	-0.00466	-0.0119	-0.00709
	(-0.00)	(-0.05)	(-1.03)	(-0.02)	(0.52)	(-0.49)	(-0.40)	(-0.50)	(0.46)	(-0.39)	(-0.84)	(-0.71)	(0.57)	(0.74)	(0.71)	(0.80)	(0.82)	(1.29)	(-0.36)	(-0.11)	(-0.10)	(-0.02)
R^2	0.017	0.002	0.001	0.000	0.041	0.002	0.002	0.004	0.018	0.006	0.007	0.008	0.000	0.007	0.013	0.017	0.022	0.025	0.011	0.005	0.003	0.003
Observations	91	91	91	90	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91

t statistics in parentheses

Norwegian equity 9 month horizon	ab4	ab5	ab11	ab1	ab3	ab6	ab10	ab18	ab2	ab7	ab8	ab9	ab12	ab13	ab14	ab15	ab16	ab17	ab19	ab20	ab21	ab22
9mndR.OSEFX	1.355	4.622	0.218	0.0754	-4.355	0.566	-0.596	1.522	0.987	-0.0583	0.425	0.595	0.0604	-0.0447	-0.162	-0.203	-0.427	-0.115	0.120	-0.0441	-0.102	-0.0117
	(1.17)	(0.26)	(0.12)	(0.12)	(-0.91)	(0.56)	(-0.32)	(0.93)	(0.91)	(-0.09)	(0.64)	(0.84)	(0.27)	(-0.11)	(-0.26)	(-0.29)	(-0.49)	(-1.18)	(0.25)	(-0.23)	(-0.19)	(-0.01)
Constant	-0.0204	-0.182	-0.398	-0.0530	0.422	-0.0616	-0.212	-0.174	0.0437	-0.0848	-0.129	-0.148	0.0409	0.0996	0.163	0.206	0.251	0.0508	-0.0775	0.00204	0.00750	0.00879
	(-0.06)	(-0.04)	(-1.03)	(-0.23)	(0.43)	(-0.21)	(-0.38)	(-0.39)	(0.16)	(-0.43)	(-0.83)	(-0.68)	(0.53)	(0.75)	(0.80)	(0.85)	(0.86)	(1.51)	(-0.41)	(0.05)	(0.06)	(0.03)
R^2	0.012	0.001	0.000	0.000	0.019	0.003	0.001	0.009	0.011	0.000	0.006	0.006	0.000	0.000	0.001	0.001	0.002	0.010	0.000	0.001	0.000	0.000
Observations	88	88	88	87	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88

t statistics in parentheses

Norwegian equity 12 month horizon	ac4	ac5	ac11	ac1	ac3	ac6	ac10	ac18	ac2	ac7	ac8	ac9	ac12	ac13	ac14	ac15	ac16	ac17	ac19	ac20	ac21	ac22
12mndR.OSEFX	2.201	1.690	-0.113	0.363	-2.150	0.672	0.422	1.207	1.025	0.00734	0.343	0.527	0.0647	0.0896	0.0619	0.121	0.0388	-0.0271	0.489	0.0783	0.181	0.314
	(1.71)	(0.10)	(-0.08)	(0.58)	(-0.61)	(0.81)	(0.16)	(0.78)	(1.20)	(0.01)	(0.64)	(0.81)	(0.54)	(0.48)	(0.21)	(0.41)	(0.09)	(-0.52)	(1.03)	(0.45)	(0.40)	(0.14)
Constant	-0.0958	-0.0944	-0.380	-0.0616	0.327	-0.108	-0.259	-0.176	0.0348	-0.0786	-0.0730	-0.0390	0.0392	0.0983	0.157	0.198	0.235	0.0532	-0.105	-0.00476	-0.00856	-0.0136
	(-0.27)	(-0.02)	(-0.96)	(-0.26)	(0.33)	(-0.36)	(-0.40)	(-0.39)	(0.13)	(-0.40)	(-0.47)	(-0.19)	(0.50)	(0.74)	(0.78)	(0.82)	(0.82)	(1.59)	(-0.56)	(-0.11)	(-0.07)	(-0.05)
R^2	0.042	0.000	0.000	0.002	0.006	0.006	0.001	0.007	0.015	0.000	0.006	0.007	0.001	0.000	0.000	0.000	0.000	0.001	0.007	0.003	0.002	0.001
Observations	85	85	85	84	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85

t statistics in parentheses

Norwegian bonds 1 month horizon	ad4	ad5	ad11	ad1	ad3	ad6	ad10	ad18	ad2	ad7	ad8	ad9	ad12	ad13	ad14	ad15	ad16	ad17	ad19	ad20	ad21	ad22
exNorwBondsReturnt	10,08	-47.74	-2.384	-16.12	107.7	28.22	46.89	-4.315	3.598	-41.64	33.99	70.92	20.40	1.406	-18.66	-20.77	-10.51	-18.31	24.00	40.89	4.511	-0.0175
	(0.32)	(-0.08)	(-0.04)	(-0.39)	(0.86)	(0.64)	(0.65)	(-0.07)	(0.08)	(-1.14)	(1.17)	(2.14)	(0.28)	(0.02)	(-0.32)	(-0.43)	(-0.28)	(-0.43)	(0.76)	(1.00)	(0.22)	(-0.00)
Constant	0.0113	0.142	0.418	-0.0321	-0.830	-0.146	0.212	-0.179	-0.189	-0.112	-0.259	-0.404	0.600	0.448	0.298	0.233	0.129	0.0384	-0.187	-0.122	-0.00847	0.00295
	(0.04)	(0.04)	(0.91)	(-0.09)	(-1.03)	(-0.35)	(0.20)	(-0.37)	(-0.40)	(-0.32)	(-1.03)	(-1.82)	(0.75)	(0.69)	(0.60)	(0.63)	(0.43)	(0.11)	(-0.87)	(-0.51)	(-0.05)	(0.02)
R^2	0.001	0.000	0.000	0.001	0.013	0.003	0.001	0.000	0.000	0.007	0.013	0.070	0.000	0.000	0.001	0.001	0.001	0.001	0.006	0.014	0.001	0.000
Observations	96	96	96	95	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96

t statistics in parentheses

Norwegian bonds 3 month horizon	ae4	ae5	ae11	ae1	ae3	ae6	ae10	ae18	ae2	ae7	ae8	ae9	ae12	ae13	ae14	ae15	ae16	ae17	ae19	ae20	ae21	ae22
Q.exNorwBondsReturn	-22.96	178.4	32.24	-12.70	37.97	-8.852	38.22	-7.889	-62.18	-48.90	6.953	15.80	26.53	9.149	-5.507	-10.74	-6.802	-22.74	-12.44	-3.952	-5.182	-2.912
	(-0.83)	(0.56)	(1.50)	(-0.53)	(0.62)	(-0.31)	(1.21)	(-0.21)	(-1.84)	(-2.13)	(0.43)	(0.90)	(0.38)	(0.16)	(-0.13)	(-0.34)	(-0.28)	(-0.71)	(-0.85)	(-0.24)	(-0.57)	(-0.47)
Constant	0.269	-1.646	0.143	0.0319	-0.864	0.0134	-0.000196	-0.157	0.386	0.186	-0.235	-0.347	0.429	0.378	0.302	0.282	0.169	0.190	-0.0202	0.0760	0.0773	0.0413
	(0.62)	(-0.40)	(0.35)	(0.09)	(-0.87)	(0.03)	(-0.00)	(-0.26)	(0.82)	(0.56)	(-0.83)	(-1.30)	(0.91)	(0.92)	(0.84)	(0.92)	(0.61)	(0.58)	(-0.08)	(0.34)	(0.55)	(0.19)
R^2	0.011	0.005	0.014	0.003	0.006	0.001	0.003	0.001	0.032	0.035	0.002	0.012	0.001	0.000	0.000	0.001	0.001	0.006	0.006	0.000	0.002	0.001
Observations	94	94	94	93	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94

t statistics in parentheses

Norwegian bonds 6 month horizon	af4	af5	af11	af1	af3	af6	af10	af18	af2	af7	af8	af9	af12	af13	af14	af15	af16	af17	af19	af20	af21	af22
6mnd.NorwBondsReturn	-32.06	34.16	36.20	-18.96	7.798	-31.17	-21.83	-7.089	1.011	-27.46	2.366	1.655	-7.800	-9.369	-10.69	-7.496	-6.980	-21.70	-16.85	-3.511	-0.750	2.557
	(-1.54)	(0.17)	(2.59)	(-1.18)	(0.22)	(-1.68)	(-0.45)	(-0.29)	(0.04)	(-1.88)	(0.22)	(0.16)	(-0.31)	(-0.41)	(-0.49)	(-0.45)	(-0.40)	(-0.91)	(-1.46)	(-0.28)	(-0.10)	(0.63)
Constant	0.708	-0.656	-0.301	0.304	-0.629	0.556	0.772	-0.120	-0.260	0.224	-0.239	-0.220	0.834	0.634	0.440	0.287	0.193	0.368	0.217	0.109	0.0390	-0.0373
	(1.22)	(-0.12)	(-0.94)	(0.70)	(-0.64)	(1.00)	(0.44)	(-0.17)	(-0.34)	(0.56)	(-0.82)	(-0.75)	(1.19)	(1.02)	(0.76)	(0.59)	(0.47)	(0.88)	(0.73)	(0.45)	(0.26)	(-0.19)
R^2	0.046	0.000	0.038	0.012	0.001	0.025	0.002	0.001	0.000	0.023	0.000	0.000	0.000	0.001	0.001	0.001	0.002	0.012	0.024	0.001	0.000	0.001
Observations	91	91	91	90	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91

t statistics in parentheses

Norwegian bonds 9 month horizon	ae4	ae5	ae11	ae1	ae3	ae6	ae10	ae18	ae2	ae7	ae8	ae9	ae12	ae13	ae14	ae15	ae16	ae17	ae19	ae20	ae21	ae22
9mnd.NorwBondsReturn	-32.55	-76.17	22.58	-5.558	-4.968	-31.19	-18.17	-4.514	-0.937	-13.64	2.340	4.770	16.38	10,84	7.019	3.532	1.657	-13.77	-16.19	-2.369	-0.287	0.843
	(-2.03)	(-0.42)	(1.58)	(-0.41)	(-0.17)	(-1.85)	(-0.29)	(-0.24)	(-0.04)	(-0.98)	(0.29)	(0.52)	(0.50)	(0.39)	(0.30)	(0.19)	(0.10)	(-0.63)	(-1.48)	(-0.21)	(-0.04)	(0.11)
Constant	1.042	2.216	-0.258	0.160	-0.369	0.810	0.924	-0.0777	-0.0225	0.195	-0.211	-0.310	0.254	0.193	0.0686	0.0869	0.0602	0.295	0.308	0.118	0.0451	-0.00798
	(1.83)	(0.31)	(-0.67)	(0.38)	(-0.38)	(1.20)	(0.33)	(-0.11)	(-0.02)	(0.35)	(-0.68)	(-0.99)	(0.47)	(0.34)	(0.10)	(0.15)	(0.11)	(0.74)	(0.91)	(0.41)	(0.24)	(-0.09)
R^2	0.066	0.002	0.021	0.002	0.000	0.036	0.002	0.001	0.000	0.009	0.001	0.003	0.002	0.001	0.001	0.000	0.000	0.007	0.033	0.000	0.000	0.000
Observations	88	88	88	87	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88

t statistics in parentheses

Norwegian bonds 12 month horizon	af4	af5	af11	af1	af3	af6	af10	af18	af2	af7	af8	af9	af12	af13	af14	af15	af16	af17	af19	af20	af21	af22
12mnd.NorwBondsReturn	-13.24	-36.69	-1.996	5.220	9.298	-30.80	-10.05	-7.119	-2.571	-9.088	1.853	3.402	50.61	38.74	28.39	18.33	8.739	-23.75	-5.509	-9.110	-3.815	-3.757
	(-0.93)	(-0.25)	(-0.25)	(0.46)	(0.45)	(-1.75)	(-0.23)	(-0.40)	(-0.14)	(-0.75)	(0.23)	(0.40)	(0.93)	(0.88)	(0.89)	(0.79)	(0.51)	(-1.01)	(-0.67)	(-0.95)	(-0.68)	(-0.54)
Constant	0.615	1.454	0.513	-0.215	-0.892	1.128	0.849	0.0638	0.0496	0.443	-0.0816	-0.269	-1.280	-1.023	-0.850	-0.541	-0.234	0.824	0.0470	0.407	0.184	0.164
	(1.14)	(0.20)	(1.14)	(-0.44)	(-0.70)	(1.29)	(0.32)	(0.08)	(0.05)	(0.78)	(-0.25)	(-0.81)	(-1.05)	(-0.98)	(-0.94)	(-0.76)	(-0.39)	(1.10)	(0.12)	(0.98)	(0.87)	(1.35)
R^2	0.014	0.001	0.000	0.002	0.001	0.046	0.001	0.002	0.000	0.008	0.001	0.002	0.019	0.017	0.016	0.012	0.005	0.027	0.005	0.009	0.005	0.003
Observations	85	85	85	84	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85

t statistics in parentheses

International equity 1 month horizon

	ag3	ag6	ag10	ag18	ag2	ag7	ag8	ag9	ag12	ag13	ag14	ag15	ag16	ag17	ag19	ag20	ag21	ag22
exMSCINordicReturnt	2,278	8,256	19,51	5,262														
	0,43	1,46	2	1,38														
exMSCIWorldReturnt					-3,789	5,009	-2,523	-12,97	-3,038	-13,11	-25,72	-29,36	-38,16	1,735	-3,872	3,242	11,91	-60,79
					-0,53	3,15	-0,4	-1,53	-0,55	-0,91	-1,04	-0,92	-0,95	0,12	-0,74	1,57	1,04	-1,27
Constant	0,109	0,195	-0,2	0,268	0,196	0,0227	0,122	0,267	0,138	0,352	0,553	0,702	0,874	0,00515	0,216	-0,00297	-0,0177	0,347
	0,44	0,73	-0,27	0,65	0,54	0,28	0,74	1,04	0,79	1,1	1,07	1,09	1,1	0,01	1,3	-0,04	-0,05	0,33
R^2	0,003	0,025	0,021	0,004	0,001	0,046	0,003	0,034	0,004	0,031	0,049	0,044	0,048	0	0,007	0,026	0,013	0,054
Observations	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96

t statistics in parentheses

International equity 3 month horizon

	ah3	ah6	ah10	ah18	ah2	ah7	ah8	ah9	ah12	ah13	ah14	ah15	ah16	ah17	ah19	ah20	ah21	ah22
Q,exMSCINordicReturn	2,402	4,713	8,859	3,491														
	0,96	2,17	1,08	1,25														
Q,exMSCIWorldReturn					-0,892	1,991	1,259	4,508	-0,122	-2,826	-6,932	-5,804	-8,011	2,975	-1,621	1,114	4,069	1,348
					-0,23	2,64	0,39	0,95	-0,06	-0,63	-0,92	-0,61	-0,66	0,44	-0,75	1,12	0,68	0,05
Constant	0,0851	0,139	-0,242	0,253	0,202	0,0189	0,102	0,149	0,13	0,324	0,54	0,675	0,832	-0,0325	0,234	-0,00362	-0,0232	0,0476
	0,34	0,52	-0,28	0,64	0,53	0,24	0,57	0,5	0,75	0,99	1,01	1,01	1	-0,08	1,42	-0,05	-0,07	0,03
R^2	0,012	0,034	0,017	0,008	0	0,032	0,004	0,018	0	0,006	0,015	0,007	0,009	0,003	0,006	0,014	0,007	0
Observations	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94

t statistics in parentheses

International equity 6 month horizon

	aj3	aj6	aj10	aj18	aj2	aj7	aj8	aj9	aj12	aj13	aj14	aj15	aj16	aj17	aj19	aj20	aj21	aj22
6mnd,MSCINordicReturn	0,0946	2,255	2,935	2,082														
	0,05	1,52	0,49	0,97														
6mndR,MSCIWorldReturn					1,579	1,176	-0,06	3,215	-0,364	-3,174	-6,363	-7,275	-9,731	1,239	-1,231	-0,223	0,294	-2,221
					0,63	1,68	-0,03	1,2	-0,23	-0,77	-0,9	-0,81	-0,86	0,28	-1,02	-0,38	0,08	-0,47
Constant	0,1	0,0543	-0,226	0,147	0,121	0,00844	0,169	0,145	0,193	0,468	0,66	0,915	1,136	-0,0227	0,239	0,0237	0,168	0,152
	0,37	0,21	-0,24	0,41	0,31	0,12	0,9	0,47	1,02	1,18	0,99	1,1	1,09	-0,05	1,49	0,35	0,58	0,13
R^2	0	0,022	0,005	0,007	0,003	0,031	0	0,024	0,001	0,021	0,034	0,03	0,035	0,001	0,009	0,001	0	0,001
Observations	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91

t statistics in parentheses

International equity 9 month horizon

	ak3	ak6	ak10	ak18	ak2	ak7	ak8	ak9	ak12	ak13	ak14	ak15	ak16	ak17	ak19	ak20	ak21	ak22
9mnd,MSCINordicReturn	-0,246	1,936	2,347	1,517														
	-0,16	1,67	0,4	0,9														
9mndR,MSCIWorldReturn					0,778	0,701	-0,179	1,182	-0,431	-1,449	-2,748	-3,063	-3,936	0,82	-0,947	0,00192	1,427	-1,28
					0,49	1,64	-0,16	0,7	-0,61	-0,85	-0,94	-0,82	-0,84	0,34	-1,1	0	0,63	-0,54
Constant	0,129	-0,055	-0,296	0,0869	0,0518	-0,00888	0,118	0,132	0,153	0,386	0,597	0,777	0,949	-0,0366	0,296	0,00122	0,0552	0,106
	0,47	-0,21	-0,27	0,25	0,12	-0,11	0,61	0,42	0,84	1,06	0,98	1,03	1,01	-0,09	1,85	0,02	0,23	0,1
R^2	0,001	0,026	0,005	0,006	0,001	0,018	0	0,006	0,002	0,008	0,011	0,009	0,01	0,001	0,012	0	0,007	0
Observations	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88

t statistics in parentheses

International equity 12 month horizon

	al3	al6	al10	al18	al2	al7	al8	al9	al12	al13	al14	al15	al16	al17	al19	al20	al21	al22
12mnd,MSCINordicReturn	-0,35	1,76	2,982	1,188														
	-0,37	1,79	0,48	0,86														
12mndR,MSCIWorldReturn					0,431	0,614	-0,34	0,662	-0,146	-0,747	-1,453	-1,72	-2,261	-0,189	-0,693	0,0446	0,681	-0,349
					0,41	1,38	-0,34	0,56	-0,29	-0,7	-0,82	-0,76	-0,79	-0,1	-0,9	0,1	0,54	-0,18
Constant	0,112	-0,0987	-0,436	0,107	0,0714	-0,0221	0,0728	0,0442	0,143	0,376	0,605	0,752	0,921	0,0292	0,314	0,00174	0,0971	0,0698
	0,44	-0,36	-0,34	0,3	0,16	-0,28	0,36	0,14	0,77	1,04	1,01	1,01	1	0,07	1,86	0,03	0,44	0,06
R^2	0,002	0,03	0,01	0,005	0,001	0,02	0,002	0,003	0	0,003	0,004	0,004	0,004	0	0,009	0	0,003	0
Observations	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85

t statistics in parentheses

International corporate bonds 1 month horizon	az3	az6	az10	az18	az2	az7	az8	az9	az12	az13	az14	az15	az16	az17	az19	az20	az21	az22
exNordicCorpBondReturnt	3.878	0.243	4.830	3.604														
	(0.74)	(0.26)	(1.15)	(0.79)														
exGlobCorpReturnt					1.990	6.279	1.385	-0.752	-7.038	-6.871	-5.387	-4.900	-2.083	-0.786	0	1.216	-17.51	28.40
					(0.53)	(1.85)	(0.49)	(-0.33)	(-2.04)	(-1.87)	(-1.53)	(-1.92)	(-1.06)	(-0.31)	(.)	(0.26)	(-1.39)	(1.34)
Constant	0.0162	-0.000897	-0.00400	0.0618	-0.0737	0.144	0.135	0.126	0.194	0.194	0.204	0.119	0.0386	0.0139	0	-0.00280	0.0442	-0.0602
	(0.10)	(-0.03)	(-0.05)	(0.66)	(-0.40)	(0.89)	(1.01)	(1.52)	(0.97)	(0.95)	(1.02)	(0.83)	(0.40)	(0.27)	(.)	(-0.01)	(0.12)	(-0.04)
R^2	0.003	0.000	0.017	0.008	0.002	0.019	0.001	0.001	0.017	0.016	0.010	0.016	0.006	0.003	.	0.000	0.030	0.006
Observations	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96

t statistics in parentheses

International corporate bonds 3 month horizon	ax3	ax6	ax10	ax18	ax2	ax7	ax8	ax9	ax12	ax13	ax14	ax15	ax16	ax17	ax19	ax20	ax21	ax22
Q.exNordicCorpBondReturn	8.721	0.0235	-0.667	0.815														
	(1.76)	(0.05)	(-0.28)	(0.34)														
Q.exGlobCorpReturn					1.334	5.255	4.716	0.957	-0.500	-0.984	1.360	-0.314	-0.0243	0.116	0	-3.302	-5.535	12,93
					(0.53)	(1.33)	(1.31)	(0.48)	(-0.18)	(-0.35)	(0.51)	(-0.17)	(-0.02)	(0.08)	(.)	(-1.42)	(-0.66)	(0.88)
Constant	-0.0619	-0.000251	0.0212	0.0658	-0.0805	0.120	0.0967	0.101	0.186	0.188	0.202	0.101	0.0287	0.0133	0	-0.0168	0.0219	-0.101
	(-0.34)	(-0.01)	(0.23)	(0.63)	(-0.42)	(0.82)	(0.79)	(1.39)	(0.93)	(0.91)	(1.00)	(0.69)	(0.29)	(0.27)	(.)	(-0.07)	(0.06)	(-0.07)
R^2	0.037	0.000	0.001	0.001	0.002	0.042	0.051	0.006	0.000	0.001	0.002	0.000	0.000	0.000	.	0.007	0.010	0.004
Observations	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94

t statistics in parentheses

International corporate bonds 6 month horizon	av3	av6	av10	av18	av2	av7	av8	av9	av12	av13	av14	av15	av16	av17	av19	av20	av21	av22
6mndR.NordicCorpBondReturn	6.038	-0.701	0.392	2.845														
	(2.09)	(-1.80)	(0.19)	(1.27)														
6mndR.GlobCorpReturn					3.344	4.777	3.833	1.213	0.275	0.0786	0.997	0.317	0.125	-0.256	0	-1.964	-1.740	-3.043
					(1.81)	(1.57)	(1.45)	(0.81)	(0.19)	(0.06)	(0.67)	(0.30)	(0.13)	(-0.60)	(.)	(-0.55)	(-0.38)	(-0.37)
Constant	-0.0871	0.0180	0.00276	0.0225	-0.139	0.0572	0.0208	0.0379	0.161	0.160	0.203	0.0874	0.0306	0.0335	0	-0.00739	-0.119	0.0515
	(-0.53)	(0.72)	(0.03)	(0.51)	(-0.72)	(0.45)	(0.19)	(0.72)	(0.78)	(0.75)	(0.98)	(0.59)	(0.32)	(0.61)	(.)	(-0.03)	(-0.44)	(0.03)
R^2	0.029	0.017	0.000	0.034	0.034	0.081	0.080	0.027	0.000	0.000	0.003	0.000	0.000	0.002	.	0.006	0.003	0.000
Observations	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91

t statistics in parentheses

International corporate bonds 9 month horizon	an3	an6	an10	an18	an2	an7	an8	an9	an12	an13	an14	an15	an16	an17	an19	an20	an21	an22
9mndR.NordicCorpBondReturn	7.145	-0.571	-1.324	1.931														
	(2.14)	(-1.24)	(-0.78)	(1.60)														
9mndR.GlobCorpReturn					2.093	2.910	2.109	0.739	-0.602	-0.784	-0.412	-0.331	-0.336	-0.299	0	-2.147	-3.220	2.489
					(1.91)	(1.38)	(1.18)	(0.71)	(-0.44)	(-0.60)	(-0.31)	(-0.32)	(-0.34)	(-0.86)	(.)	(-0.64)	(-1.04)	(0.28)
Constant	-0.186	0.0226	0.0616	0.0342	-0.138	0.0492	0.0526	0.0599	0.210	0.217	0.231	0.127	0.0459	0.0860	0	0.0165	-0.0473	-0.0815
	(-1.14)	(0.93)	(0.51)	(0.59)	(-0.69)	(0.35)	(0.48)	(1.12)	(0.94)	(0.94)	(1.03)	(0.79)	(0.45)	(2.33)	(.)	(0.07)	(-0.20)	(-0.05)
R^2	0.046	0.013	0.006	0.018	0.019	0.042	0.034	0.014	0.001	0.002	0.001	0.001	0.002	0.008	.	0.009	0.022	0.000
Observations	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88

t statistics in parentheses

International corporate bonds 12 month horizon	am3	am6	am10	am18	am2	am7	am8	am9	am12	am13	am14	am15	am16	am17	am19	am20	am21	am22
12mndR.NordicCorpBondReturn	8.183	-0.324	-3.305	2.588														
	(2.70)	(-0.79)	(-2.22)	(1.62)														
12mndR.GlobCorpReturn					1.114	0.575	-0.848	-0.425	-1.354	-1.334	-1.389	-0.915	-0.708	-0.473	0	-1.464	-2.918	1.121
					(0.88)	(0.73)	(-1.92)	(-2.09)	(-0.86)	(-0.86)	(-0.90)	(-0.82)	(-0.82)	(-1.93)	(.)	(-0.54)	(-1.54)	(0.10)
Constant	-0.299	0.0184	0.159	0.00342	-0.120	-0.0355	-0.00649	0.0265	0.249	0.255	0.253	0.156	0.0614	0.107	0	0.00886	-0.0390	-0.0495
	(-1.18)	(0.53)	(1.56)	(0.14)	(-0.61)	(-0.26)	(-0.10)	(0.77)	(0.97)	(0.98)	(0.99)	(0.84)	(0.52)	(2.64)	(.)	(0.04)	(-0.19)	(-0.02)
R^2	0.063	0.004	0.038	0.034	0.005	0.005	0.023	0.027	0.007	0.006	0.007	0.006	0.008	0.022	.	0.004	0.031	0.000
Observations	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85

t statistics in parentheses

10.1.7 Residual analysis TM model

Durbin-Watson statistic																					
dw1	dw4	dw5	dw11	dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
1,6498	2,0920	1,9092	2,2855	2,1060	1,3710	1,6593	1,9620	1,2961	1,6192	1,8173	2,0043	1,6763	1,9793	2,1754	2,2683	2,3274	2,0168	2,0424	1,8937	2,4353	2,5571
Shapiro–Wilk statistic																					
sw1z	sw4z	sw5z	sw11z	sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
0,9487	3,8753	0,9128	0,6745	1,0331	2,5158	3,7126	1,2937	3,9220	4,1188	0,2373	0,2532	-0,5972	0,0748	0,2569	-0,5214	-0,9850	1,1200	0,0624	0,1992	1,5393	0,9651
Shapiro–Wilk statistic P-value																					
sw1p	sw4p	sw5p	sw11p	sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,1714	0,0001	0,1807	0,2500	0,1508	0,0059	0,0001	0,0979	0,0000	0,0000	0,4062	0,4001	0,7248	0,4702	0,3986	0,6990	0,8377	0,1313	0,4751	0,4211	0,0619	0,1672
Whites test statistic																					
wwht1	wwht4	wwht5	wwht11	wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
13,9806	62,9122	46,5378	15,9374	37,6219	60,5722	34,6631	71,7585	44,6552	88,6947	59,7708	65,1832	73,7988	71,7804	69,1866	59,9229	54,8801	43,5008	48,2174	53,3312	47,5217	47,7014
Whites test statistic P-value																					
wwhtp1	wwhtp4	wwhtp5	wwhtp11	wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,3019	0,0000	0,0000	0,1941	0,5778	0,0194	0,7088	0,0015	0,2825	0,0000	0,0229	0,0072	0,0009	0,0015	0,0028	0,0222	0,0587	0,3247	0,1747	0,0772	0,1930	0,1881

10.1.8 Residual analysis HM model

Durbin-Watson statistic																					
dw1	dw4	dw5	dw11	dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
1,6272	2,0629	1,8333	2,2671	2,0776	1,3006	1,6616	1,9901	1,2699	1,6946	1,7698	1,9862	1,6881	1,9803	2,1634	2,2458	2,3044	2,0643	2,0339	1,8811	2,4321	2,5743
Shapiro–Wilk statistic																					
sw1z	sw4z	sw5z	sw11z	sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
1,2385	4,3794	2,2393	0,9129	1,9735	3,3558	3,3694	0,9981	3,7235	3,5234	0,6308	0,5511	0,1097	1,3186	1,4233	0,8833	-0,1164	1,0281	-0,5334	-0,4080	1,7724	0,9916
Shapiro–Wilk statistic P-value																					
sw1p	sw4p	sw5p	sw11p	sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,1078	0,0000	0,0126	0,1806	0,0242	0,0004	0,0004	0,1591	0,0001	0,0002	0,2641	0,2908	0,4563	0,0937	0,0773	0,1885	0,5463	0,1519	0,7031	0,6584	0,0382	0,1607
Whites test statistic																					
wwht1	wwht4	wwht5	wwht11	wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
16,0126	50,4100	41,2069	13,8788	38,0649	68,7812	42,0187	70,4607	49,1079	85,8144	59,8761	59,6810	77,3971	73,6859	71,8958	63,2442	58,9842	47,5900	52,6188	48,3382	38,3827	39,8735
Whites test statistic P-value																					
wwhtp1	wwhtp4	wwhtp5	wwhtp11	wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,1907	0,0000	0,0000	0,3085	0,5577	0,0031	0,3835	0,0021	0,1531	0,0000	0,0224	0,0233	0,0004	0,0009	0,0015	0,0110	0,0269	0,1911	0,0873	0,1716	0,5432	0,4759

10.1.9 Residual analysis multi-factor TM

Durbin-Watson statistic																					
dw1	dw4	dw5	dw11	dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
1,7364	2,0446	1,8978	2,1878	2,1363	1,4745	1,7770	2,0154	1,3323	1,5619	1,5612	1,8781	1,7032	1,9021	2,0754	2,1687	2,2373	1,9723	1,9650	1,8602	2,4828	2,6443
Shapiro–Wilk statistic																					
sw1z	sw4z	sw5z	sw11z	sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
0,0781	4,2826	1,0031	-0,6753	1,0140	1,1260	4,2541	1,1472	2,8223	3,0984	0,0999	2,1733	-0,6803	-1,2708	-0,8416	-0,9898	-2,0162	1,7032	-2,9833	1,4147	1,8162	1,1665
Shapiro–Wilk statistic P-value																					
sw1p	sw4p	sw5p	sw11p	sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,4689	0,0000	0,1579	0,7502	0,1553	0,1301	0,0000	0,1257	0,0024	0,0010	0,4602	0,0149	0,7519	0,8981	0,8000	0,8389	0,9781	0,0443	0,9986	0,0786	0,0347	0,1217
Whites test statistic																					
wwht1	wwht4	wwht5	wwht11	wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
39,3468	85,4227	63,7555	55,0651	93,7640	93,7728	64,3087	92,4844	94,2516	94,7941	92,8147	94,9030	94,6407	87,6980	85,6367	81,9359	79,6204	92,5338	68,4419	89,7662	88,8872	90,4793
Whites test statistic P-value																					
wwhtp1	wwhtp4	wwhtp5	wwhtp11	wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,2069	0,0000	0,0010	0,0093	0,2658	0,2656	0,9613	0,2970	0,2544	0,2422	0,2888	0,2397	0,2456	0,4288	0,4908	0,6041	0,6729	0,2958	0,2680	0,3693	0,3942	0,3496

10.1.10 Residual analysis multi-factor HM

Durbin-Watson statistic																					
dw1	dw4	dw5	dw11	dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
1,7147	2,0045	1,8188	2,1807	2,1117	1,4142	1,7777	2,0931	1,3327	1,6188	1,5460	1,9119	1,7006	1,9076	2,0738	2,1615	2,2288	2,0305	1,9368	1,8375	2,5079	2,6934
Shapiro–Wilk statistic																					
sw1z	sw4z	sw5z	sw11z	sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
0,4087	4,7718	1,9518	-1,0715	2,1541	2,5977	3,9558	1,9656	1,9946	3,0412	0,3943	1,4811	0,0358	0,0107	0,5499	-0,3056	-1,2465	1,1828	-1,7014	1,6243	1,9423	0,6776
Shapiro–Wilk statistic P-value																					
sw1p	sw4p	sw5p	sw11p	sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,3414	0,0000	0,0255	0,8580	0,0156	0,0047	0,0000	0,0247	0,0230	0,0012	0,3467	0,0693	0,4857	0,4957	0,2912	0,6201	0,8937	0,1184	0,9556	0,0522	0,0261	0,2490
Whites test statistic																					
wwht1	wwht4	wwht5	wwht11	wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
45,3535	80,2060	60,9442	56,3424	90,0435	91,5967	88,8037	94,3949	93,2989	95,2083	95,0116	94,3586	93,9176	91,7679	89,3911	86,3238	83,8502	91,7098	75,1643	90,3352	91,0286	91,4294
Whites test statistic P-value																					
wwhtp1	wwhtp4	wwhtp5	wwhtp11	wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,0744	0,0000	0,0022	0,0069	0,3616	0,3197	0,3966	0,2512	0,2769	0,2330	0,2373	0,2520	0,2622	0,3153	0,3798	0,4699	0,5455	0,3168	0,1217	0,3535	0,3348	0,3241

10.1.11 VIF multi-factor TM

TM					
Fund 1		Fund 4		Fund 5	
Variable	VIF	Variable	VIF	Variable	VIF
Term premium	2,53	Term premium	2,53	Term premium	2,53
Norwegian equities	2,15	Norwegian equities	2,15	Norwegian equities	2,16
Norw bonds	2,14	Norw bonds	2,14	Norw bonds	2,15
Norw equities timing	1,41	Norw equities timing	1,41	Norw equities timing	1,42
HML	1,19	HML	1,19	HML	1,19
SMB	1,16	SMB	1,16	SMB	1,16
NorwBonds timing	1,15	NorwBonds timing	1,15	NorwBonds timing	1,15
Fund 11		Fund 3		Fund 6	
Variable	VIF	Variable	VIF	Variable	VIF
Term premium	2,53	Norwegian equities	8,45	Norwegian equities	8,45
Norwegian equities	2,16	MSCINordic	4,50	MSCINordic	4,50
Norw bonds	2,15	Term premium	2,76	Term premium	2,76
Norw equities timing	1,42	Nordic bonds	2,54	Nordic bonds	2,54
HML	1,19	Norw bonds	2,22	Norw bonds	2,22

SMB	1,16	Norw equities timing	2,21	Norw equities timing	2,21
NorwBonds timing	1,15	Nordic equities timing	2,03	Nordic equities timing	2,03
		SMBNordic	1,81	SMBNordic	1,81
		SMB	1,61	SMB	1,61
		HML	1,44	HML	1,44
		Nordic bonds timing	1,28	Nordic bonds timing	1,28
		HMLNordic	1,25	HMLNordic	1,25
		NorwBonds timing	1,21	NorwBonds timing	1,21

Fund 10		Fund 18		Fund 2	
Variable	VIF	Variable	VIF	Variable	VIF
Norwegian equities	8,45	Norwegian equities	8,45	Norwegian equities	5,79
MSCINordic	4,50	MSCINordic	4,50	Global equites	3,78
Term premium	2,76	Term premium	2,76	Global corp bonds	3,21
Nordic bonds	2,54	Nordic bonds	2,54	Term premium	2,65
Norw bonds	2,22	Norw bonds	2,22	Norw bonds	2,46
Norw equities timing	2,21	Norw equities timing	2,21	Norw equities timing	2,00
Nordic equities timing	2,03	Nordic equities timing	2,03	Global equities timing	1,55
SMBNordic	1,81	SMBNordic	1,81	globalHML	1,54
SMB	1,61	SMB	1,61	globalSMB	1,54
HML	1,44	HML	1,44	SMB	1,45
Nordic bonds timing	1,28	Nordic bonds timing	1,28	HML	1,30
HMLNordic	1,25	HMLNordic	1,25	NorwBonds timing	1,23
NorwBonds timing	1,21	NorwBonds timing	1,21	Global bonds timing	1,21

Fund 7		Fund 8		Fund 9	
Variable	VIF	Variable	VIF	Variable	VIF
Norwegian equities	5,85	Norwegian equities	5,85	Norwegian equities	5,85
Global equites	3,84	Global equites	3,84	Global equites	3,84
Global corp bonds	3,29	Global corp bonds	3,29	Global corp bonds	3,29
Term premium	2,66	Term premium	2,66	Term premium	2,66
Norw bonds	2,47	Norw bonds	2,47	Norw bonds	2,47
Norw equities timing	2,00	Norw equities timing	2,00	Norw equities timing	2,00
Global equities timing	1,56	Global equities timing	1,56	Global equities timing	1,56
globalSMB	1,54	globalSMB	1,54	globalSMB	1,54
globalHML	1,54	globalHML	1,54	globalHML	1,54
SMB	1,45	SMB	1,45	SMB	1,45
HML	1,29	HML	1,29	HML	1,29
NorwBonds timing	1,24	NorwBonds timing	1,24	NorwBonds timing	1,24
Global bonds timing	1,21	Global bonds timing	1,21	Global bonds timing	1,21

Fund 12		Fund 13		Fund 14	
Variable	VIF	Variable	VIF	Variable	VIF
Norwegian equities	5,79	Norwegian equities	5,79	Norwegian equities	5,79
Global equites	3,80	Global equites	3,80	Global equites	3,80
Global corp bonds	3,25	Global corp bonds	3,25	Global corp bonds	3,25

Term premium	2,67
Norw bonds	2,46
Norw equities timing	1,99
globalSMB	1,54
globalHML	1,54
Global equities timing	1,54
SMB	1,45
HML	1,29
NorwBonds timing	1,23
Global bonds timing	1,19

Term premium	2,67
Norw bonds	2,46
Norw equities timing	1,99
globalSMB	1,54
globalHML	1,54
Global equities timing	1,54
SMB	1,45
HML	1,29
NorwBonds timing	1,23
Global bonds timing	1,19

Term premium	2,67
Norw bonds	2,46
Norw equities timing	1,99
globalSMB	1,54
globalHML	1,54
Global equities timing	1,54
SMB	1,45
HML	1,29
NorwBonds timing	1,23
Global bonds timing	1,19

Fund 15

Variable	VIF
Norwegian equities	5,79
Global equites	3,80
Global corp bonds	3,25
Term premium	2,67
Norw bonds	2,46
Norw equities timing	1,99
globalSMB	1,54
globalHML	1,54
Global equities timing	1,54
SMB	1,45
HML	1,29
NorwBonds timing	1,23
Global bonds timing	1,19

Fund 16

Variable	VIF
Norwegian equities	5,79
Global equites	3,80
Global corp bonds	3,25
Term premium	2,67
Norw bonds	2,46
Norw equities timing	1,99
globalSMB	1,54
globalHML	1,54
Global equities timing	1,54
SMB	1,45
HML	1,29
NorwBonds timing	1,23
Global bonds timing	1,19

Fund 17

Variable	VIF
Norwegian equities	5,79
Global equites	3,80
Global corp bonds	3,25
Term premium	2,67
Norw bonds	2,46
Norw equities timing	1,99
globalSMB	1,54
globalHML	1,54
Global equities timing	1,54
SMB	1,45
HML	1,29
NorwBonds timing	1,23
Global bonds timing	1,19

Fund 19

Variable	VIF
Norwegian equities	5,85
Global equites	3,83
Term premium	2,67
Norw bonds	2,47
Norw equities timing	1,98
Global equities timing	1,55
globalSMB	1,54
globalHML	1,54
SMB	1,45
HML	1,29
NorwBonds timing	1,24
Global bonds timing	1,19

Fund 20

Variable	VIF
Norwegian equities	5,79
Global equites	3,81
Global corp bonds	3,31
Term premium	2,64
Norw bonds	2,46
Norw equities timing	1,98
globalSMB	1,55
Global equities timing	1,54
globalHML	1,54
SMB	1,45
HML	1,29
NorwBonds timing	1,24
Global bonds timing	1,19

Fund 21

Variable	VIF
Norwegian equities	5,79
Global equites	3,81
Global corp bonds	3,31
Term premium	2,64
Norw bonds	2,46
Norw equities timing	1,98
globalSMB	1,55
Global equities timing	1,54
globalHML	1,54
SMB	1,45
HML	1,29
NorwBonds timing	1,24
Global bonds timing	1,19

Fund 22

Variable	VIF
Norwegian equities	5,79
Global equites	3,80

Global corp bonds	3,25
Term premium	2,67
Norw bonds	2,46
Norw equities timing	1,99
globalSMB	1,54
globalHML	1,54
Global equities timing	1,54
SMB	1,45
HML	1,29
NorwBonds timing	1,23
Global bonds timing	1,19

10.1.12 VIF multi-factor HM

HM

Fund 1		Fund 4		Fund 5	
Variable	VIF	Variable	VIF	Variable	VIF
Norw bonds	5,92	Norw bonds	5,92	Norw bonds	5,92
NorwBonds timing	5,40	NorwBonds timing	5,40	NorwBonds timing	5,40
Norwegian equities	2,67	Norwegian equities	2,67	Norwegian equities	2,66
Term premium	2,53	Term premium	2,53	Term premium	2,53
Norw equities timing	2,23	Norw equities timing	2,23	Norw equities timing	2,23
HML	1,19	HML	1,19	HML	1,19
SMB	1,17	SMB	1,17	SMB	1,17

Fund 11		Fund 3		Fund 6	
Variable	VIF	Variable	VIF	Variable	VIF
Norw bonds	5,92	Norwegian equities	13,78	Norwegian equities	13,78
NorwBonds timing	5,40	MSCINordic	12,84	MSCINordic	12,84
Norwegian equities	2,67	Nordic bonds	6,93	Nordic bonds	6,93
Term premium	2,54	Nordic bonds timing	6,31	Nordic bonds timing	6,31
Norw equities timing	2,23	Norw bonds	6,16	Norw bonds	6,16
HML	1,19	NorwBonds timing	5,65	NorwBonds timing	5,65
SMB	1,17	Nordic equities timing	5,07	Nordic equities timing	5,07
		Norw equities timing	3,70	Norw equities timing	3,70
		Term premium	2,79	Term premium	2,79
		SMBNordic	1,83	SMBNordic	1,83
		SMB	1,65	SMB	1,65
		HML	1,43	HML	1,43
		HMLNordic	1,24	HMLNordic	1,24

Fund 10		Fund 18		Fund 2	
Variable	VIF	Variable	VIF	Variable	VIF
Norwegian equities	13,78	Norwegian equities	13,78	Global corp bonds	6,90
MSCINordic	12,84	MSCINordic	12,84	Norwegian equities	6,65
Nordic bonds	6,93	Nordic bonds	6,93	Norw bonds	6,35

Nordic bonds timing	6,31	Nordic bonds timing	6,31	Global equites	6,31
Norw bonds	6,16	Norw bonds	6,16	NorwBonds timing	5,93
NorwBonds timing	5,65	NorwBonds timing	5,65	Global bonds timing	4,59
Nordic equities timing	5,07	Nordic equities timing	5,07	Global equities timing	4,30
Norw equities timing	3,70	Norw equities timing	3,70	Norw equities timing	3,13
Term premium	2,79	Term premium	2,79	Term premium	2,64
SMBNordic	1,83	SMBNordic	1,83	globalHML	1,54
SMB	1,65	SMB	1,65	globalSMB	1,53
HML	1,43	HML	1,43	SMB	1,49
HMLNordic	1,24	HMLNordic	1,24	HML	1,29

Fund 7		Fund 8		Fund 9	
Variable	VIF	Variable	VIF	Variable	VIF
Global corp bonds	6,99	Global corp bonds	6,99	Global corp bonds	6,99
Norwegian equities	6,76	Norwegian equities	6,76	Norwegian equities	6,76
Norw bonds	6,34	Norw bonds	6,34	Norw bonds	6,34
Global equites	6,26	Global equites	6,26	Global equites	6,26
NorwBonds timing	5,95	NorwBonds timing	5,95	NorwBonds timing	5,95
Global bonds timing	4,61	Global bonds timing	4,61	Global bonds timing	4,61
Global equities timing	4,20	Global equities timing	4,20	Global equities timing	4,20
Norw equities timing	3,13	Norw equities timing	3,13	Norw equities timing	3,13
Term premium	2,64	Term premium	2,64	Term premium	2,64
globalHML	1,54	globalHML	1,54	globalHML	1,54
globalSMB	1,53	globalSMB	1,53	globalSMB	1,53
SMB	1,49	SMB	1,49	SMB	1,49
HML	1,29	HML	1,29	HML	1,29

Fund 12		Fund 13		Fund 14	
Variable	VIF	Variable	VIF	Variable	VIF
Global corp bonds	6,99	Global corp bonds	6,99	Global corp bonds	6,99
Norwegian equities	6,63	Norwegian equities	6,63	Norwegian equities	6,63
Norw bonds	6,34	Norw bonds	6,34	Norw bonds	6,34
Global equites	6,24	Global equites	6,24	Global equites	6,24
NorwBonds timing	5,93	NorwBonds timing	5,93	NorwBonds timing	5,93
Global bonds timing	4,59	Global bonds timing	4,59	Global bonds timing	4,59
Global equities timing	4,21	Global equities timing	4,21	Global equities timing	4,21
Norw equities timing	3,12	Norw equities timing	3,12	Norw equities timing	3,12
Term premium	2,65	Term premium	2,65	Term premium	2,65
globalHML	1,54	globalHML	1,54	globalHML	1,54
globalSMB	1,53	globalSMB	1,53	globalSMB	1,53
SMB	1,48	SMB	1,48	SMB	1,48
HML	1,29	HML	1,29	HML	1,29

Fund 15		Fund 16		Fund 17	
Variable	VIF	Variable	VIF	Variable	VIF
Global corp bonds	6,99	Global corp bonds	6,99	Global corp bonds	6,99

Norwegian equities	6,63
Norw bonds	6,34
Global equites	6,24
NorwBonds timing	5,93
Global bonds timing	4,59
Global equities timing	4,21
Norw equities timing	3,12
Term premium	2,65
globalHML	1,54
globalSMB	1,53
SMB	1,48
HML	1,29

Norwegian equities	6,63
Norw bonds	6,34
Global equities	6,24
NorwBonds timing	5,93
Global bonds timing	4,59
Global equities timing	4,21
Norw equities timing	3,12
Term premium	2,65
globalHML	1,54
globalSMB	1,53
SMB	1,48
HML	1,29

Norwegian equities	6,63
Norw bonds	6,34
Global equites	6,24
NorwBonds timing	5,93
Global bonds timing	4,59
Global equities timing	4,21
Norw equities timing	3,12
Term premium	2,65
globalHML	1,54
globalSMB	1,53
SMB	1,48
HML	1,29

Fund 19

Variable	VIF
Norwegian equities	6,72
Norw bonds	6,33
Global equites	6,25
NorwBonds timing	5,95
Global bonds timing	4,59
Global equities timing	4,21
Norw equities timing	3,11
Term premium	2,65
globalHML	1,53
globalSMB	1,53
SMB	1,48
HML	1,29

Fund 20

Variable	VIF
Global corp bonds	7,02
Norwegian equities	6,69
Norw bonds	6,31
Global equites	6,27
NorwBonds timing	5,94
Global bonds timing	4,61
Global equities timing	4,25
Norw equities timing	3,12
Term premium	2,63
globalHML	1,53
globalSMB	1,53
SMB	1,48
HML	1,29

Fund 21

Variable	VIF
Global crop bonds	7,02
Norwegian equities	6,69
Norw bonds	6,31
Global equites	6,27
NorwBonds timing	5,94
Global bonds timing	4,61
Global equities timing	4,25
Norw equities timing	3,12
Term premium	2,63
globalHML	1,53
globalSMB	1,53
SMB	1,48
HML	1,29

Fund 22

Variable	VIF
Global corp bonds	6,99
Norwegian equities	6,63
Norw bonds	6,34
Global equites	6,24
NorwBonds timing	5,93
Global bonds timing	4,59
Global equities timing	4,21
Norw equities timing	3,12
Term premium	2,65
globalHML	1,54
globalSMB	1,53
SMB	1,48
HML	1,29

10.1.13 Residual analysis holdings based model

Norwegian Bonds 1 Month																					
Durbin-Watson statistic																					
dw1	dw4	dw5	dw11	dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
2,37104	2,01999	2,39146	1,97667	1,96551	1,78727	2,18725	2,52812	2,04548	1,85131	1,96186	1,78096	2,03680	2,09495	2,14829	2,20320	2,39969	2,06635	1,92233	1,77636	1,90903	2,56582
Shapiro–Wilk statistic																					
sw1z	sw4z	sw5z	sw11z	sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
5,19154	6,68343	7,45336	6,47635	7,97744	2,29514	7,97899	5,06477	6,58640	5,14744	3,99664	4,30636	9,02758	8,81482	8,37621	8,00899	7,07119	7,59365	4,81370	6,81381	4,98065	6,58640
Shapiro–Wilk statistic P-value																					
sw1p	sw4p	sw5p	sw11p	sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00000	0,00000	0,00000	0,01086	0,00000	0,00000	0,00000	0,00000	0,00003	0,00001	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
Whites test statistic																					
wwht1	wwht4	wwht5	wwht11	wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
0,51643	0,76904	1,68847	1,24994	1,07190	2,08452	1,78736	0,75437	1,10050	1,65441	1,56483	2,68809	0,43687	0,44692	0,53111	0,58306	0,83636	1,52467	0,84246	2,88700	0,04084	0,97343
Whites test statistic P-value																					
wwhtp1	wwhtp4	wwhtp5	wwhtp11	wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,77243	0,68078	0,42988	0,53528	0,58511	0,35266	0,40915	0,68579	0,57681	0,43727	0,45730	0,26079	0,80377	0,79975	0,76678	0,74712	0,65824	0,46658	0,65624	0,23610	0,97979	0,61464

Norwegian Bonds 3 Months																					
Durbin-Watson statistic																					
dw1	dw4	dw5	dw11	dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
2,36796	2,07038	2,41696	1,98811	1,92144	1,76096	2,17614	2,53832	2,07677	1,89877	1,93126	1,78079	2,03853	2,09576	2,14950	2,20574	2,40196	2,04604	1,96437	1,82829	1,93877	2,58067
Shapiro–Wilk statistic																					
sw1z	sw4z	sw5z	sw11z	sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
5,12156	6,38653	7,15445	6,46395	7,97667	2,14977	7,89442	5,00286	6,21315	4,89799	4,18411	4,93999	8,94710	8,74663	8,32056	7,96161	7,00546	7,49714	4,60165	7,08827	5,06449	6,21315
Shapiro–Wilk statistic P-value																					
sw1p	sw4p	sw5p	sw11p	sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00000	0,00000	0,00000	0,01579	0,00000	0,00000	0,00000	0,00000	0,00001	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
Whites test statistic																					
wwht1	wwht4	wwht5	wwht11	wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
1,66814	1,40044	4,49805	0,72049	0,46149	1,83228	1,95934	1,14935	0,93356	1,75577	0,56623	1,37792	1,05501	1,11998	1,28946	1,28937	2,66802	4,22733	0,33083	1,75582	1,35700	2,00545
Whites test statistic P-value																					
wwhtp1	wwhtp4	wwhtp5	wwhtp11	wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,43428	0,49648	0,10550	0,69751	0,79394	0,40006	0,37544	0,56289	0,62702	0,41566	0,75343	0,50210	0,59007	0,57121	0,52480	0,52483	0,26342	0,12079	0,84754	0,41565	0,50738	0,36688

Norwegian Bonds 6 months																					
Durbin-Watson statistic																					
dw1	dw4	dw5	dw11	dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
2,38240	2,15627	2,39901	2,04965	1,90335	1,75659	2,17739	2,54675	2,05010	1,91871	1,89159	1,77434	2,02911	2,09080	2,15154	2,21306	2,41652	2,05174	1,98398	1,83065	1,92894	2,57433
Shapiro–Wilk statistic																					
sw1z	sw4z	sw5z	sw11z	sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
4,85774	6,01077	7,20872	6,32071	7,94433	2,51228	7,77972	4,95512	6,43242	4,88447	4,17455	5,15091	8,92365	8,70660	8,27594	7,92049	6,94506	7,50866	4,36368	6,96893	4,97670	6,43242
Shapiro–Wilk statistic P-value																					
sw1p	sw4p	sw5p	sw11p	sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00000	0,00000	0,00000	0,00600	0,00000	0,00000	0,00000	0,00000	0,00001	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00001	0,00000	0,00000	0,00000
Whites test statistic																					
wwht1	wwht4	wwht5	wwht11	wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
0,56347	4,22506	0,08276	1,48748	0,00639	1,02964	2,05406	0,49129	0,16860	1,71111	0,25031	0,03897	0,52926	0,51020	0,42037	0,41708	0,49116	4,58737	0,23306	2,61140	4,21055	1,43690
Whites test statistic P-value																					
wwhtp1	wwhtp4	wwhtp5	wwhtp11	wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,75447	0,12093	0,95946	0,47533	0,99681	0,59761	0,35807	0,78220	0,91915	0,42505	0,88236	0,98071	0,76749	0,77484	0,81043	0,81177	0,78225	0,10089	0,89000	0,27098	0,12181	0,48751

Norwegian Bonds 9 months																					
Durbin-Watson statistic																					
dw1	dw4	dw5	dw11	dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
2,37742	2,17289	2,40406	1,95622	1,89694	1,79343	2,17842	2,56722	2,06650	1,93131	1,92510	1,77464	2,03238	2,09154	2,15229	2,21565	2,42740	2,07339	1,98000	1,82630	1,92604	2,57342
Shapiro–Wilk statistic																					
sw1z	sw4z	sw5z	sw11z	sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
4,91153	5,84416	6,92994	6,45856	7,84047	2,40220	7,68533	4,93384	6,33044	4,66867	4,28967	4,90342	8,81457	8,61022	8,19113	7,84434	6,96237	7,50324	4,68405	6,85081	4,85968	6,33044
Shapiro–Wilk statistic P-value																					
sw1p	sw4p	sw5p	sw11p	sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00000	0,00000	0,00000	0,00815	0,00000	0,00000	0,00000	0,00000	0,00001	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
Whites test statistic																					
wwht1	wwht4	wwht5	wwht11	wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
2,09756	2,14893	1,13413	1,38636	0,25186	0,57935	8,32579	0,26977	2,76258	0,55614	1,47363	0,59419	0,59739	0,56903	0,38731	0,23109	1,09161	11,34800	3,38295	2,84452	3,36238	1,98810
Whites test statistic P-value																					
wwhtp1	wwhtp4	wwhtp5	wwhtp11	wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,35036	0,34148	0,56719	0,49998	0,88168	0,74851	0,01556	0,87382	0,25125	0,75724	0,47863	0,74297	0,74178	0,75238	0,82394	0,89088	0,57938	0,00343	0,18425	0,24117	0,18615	0,37007

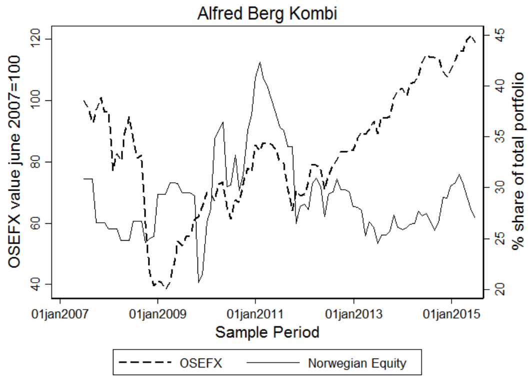
Norwegian Bonds 12 Months																					
Durbin-Watson statistic																					
dw1	dw4	dw5	dw11	dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
2,37481	2,08036	2,40012	1,91937	1,89874	1,80436	2,17742	2,57304	2,06882	2,54840	2,03487	1,63430	2,06553	2,12471	2,18929	2,24632	2,43639	2,11216	1,95828	1,71672	1,83024	2,56788
Shapiro–Wilk statistic																					
sw1z	sw4z	sw5z	sw11z	sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
4,62740	5,99504	6,87021	6,57480	7,76317	2,03786	7,60492	4,61840	6,15553	2,19520	2,22843	4,88515	8,57391	8,34923	7,87896	7,54395	6,62336	7,18460	4,72768	6,58058	4,64522	6,15553
Shapiro–Wilk statistic P-value																					
sw1p	sw4p	sw5p	sw11p	sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00000	0,00000	0,00000	0,02078	0,00000	0,00000	0,00000	0,01407	0,01293	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
Whites test statistic																					
wwht1	wwht4	wwht5	wwht11	wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
2,92988	2,96886	0,05926	3,65259	1,25240	3,97886	3,71232	0,29542	2,23614	1,51306	3,31800	3,50867	3,30442	3,35830	3,15125	3,11997	6,48689	20,55998	0,13567	0,63874	2,36109	2,17036
Whites test statistic P-value																					
wwhtp1	wwhtp4	wwhtp5	wwhtp11	wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,23109	0,22663	0,97081	0,16101	0,53462	0,13677	0,15627	0,86268	0,32691	0,46929	0,19033	0,17302	0,19163	0,18653	0,20688	0,21014	0,03903	0,00003	0,93441	0,72661	0,30711	0,33784

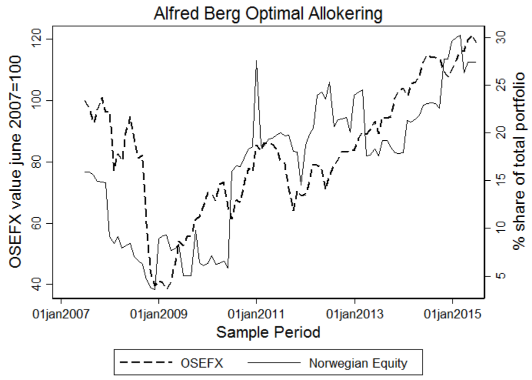
Norwegian Equity 1 Month																					
Durbin-Watson statistic																					
dw1	dw4	dw5	dw11	dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
1,96005	2,31019	2,60405	2,17784	2,08774	1,61018	2,05553	1,64205	2,45264	1,79187	2,10515	2,19470	2,24547	2,31285	2,36002	2,28877	2,33884	2,30265	2,31457	2,04466	2,02224	2,72026
Shapiro–Wilk statistic																					
sw1z	sw4z	sw5z	sw11z	sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
5,19031	6,14973	6,93174	4,55325	8,05671	4,68884	7,53980	4,69742	5,94472	8,15471	2,92223	3,01661	6,01871	6,23353	6,69697	7,16543	7,44227	6,27257	5,89422	6,37121	6,07518	5,94472
Shapiro–Wilk statistic P-value																					
sw1p	sw4p	sw5p	sw11p	sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00174	0,00128	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
Whites test statistic																					
wwht1	wwht4	wwht5	wwht11	wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
0,41007	0,84119	1,04041	6,03957	0,12689	0,33140	0,85385	1,65098	0,88133	2,25192	1,25904	4,79117	3,23422	33,27224	39,16664	42,11591	42,70768	36,85276	0,41068	0,24467	0,26874	0,28610
Whites test statistic P-value																					
wwhtp1	wwhtp4	wwhtp5	wwhtp11	wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,81462	0,65666	0,59440	0,04881	0,93852	0,84730	0,65251	0,43802	0,64361	0,32434	0,53285	0,09112	0,19847	0,00000	0,00000	0,00000	0,00000	0,00000	0,81437	0,88485	0,87427	0,86671
Norwegian Equity 3 months																					
Durbin-Watson statistic																					
dw1	dw4	dw5	dw11	dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
1,96192	2,19448	2,54552	2,12951	2,06461	1,61798	2,02956	1,61652	2,41839	1,79227	2,04529	2,21810	2,26375	2,24962	2,24678	2,14541	2,14948	2,18425	2,37660	2,08168	2,04059	2,74441
Shapiro–Wilk statistic																					
sw1z	sw4z	sw5z	sw11z	sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
5,19083	6,16607	7,32347	4,94743	8,03449	4,67870	7,54274	4,82215	5,89550	8,04237	2,91253	2,90711	6,40796	6,98785	7,35451	7,75131	7,87996	6,77148	5,99483	6,25097	5,96060	5,89550
Shapiro–Wilk statistic P-value																					
sw1p	sw4p	sw5p	sw11p	sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00179	0,00182	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
Whites test statistic																					
wwht1	wwht4	wwht5	wwht11	wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
0,94668	0,01214	0,61402	0,64691	0,44935	0,95902	1,82024	0,35849	1,01014	0,31934	0,93832	2,40811	0,40201	5,32286	6,41151	7,19595	7,75156	7,25638	0,73429	0,58587	0,03719	0,78926
Whites test statistic P-value																					
wwhtp1	wwhtp4	wwhtp5	wwhtp11	wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,62292	0,99395	0,73564	0,72364	0,79878	0,61909	0,40248	0,83590	0,60346	0,85242	0,62553	0,29998	0,81791	0,06985	0,04053	0,02738	0,02074	0,02656	0,69271	0,74607	0,98158	0,67393
Norwegian Equity 6 months																					
Durbin-Watson statistic																					
dw1	dw4	dw5	dw11	dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
1,95680	2,20726	2,50805	2,07452	2,10050	1,55745	2,04299	1,63614	2,47143	1,80274	1,97587	2,11435	2,28371	2,20756	2,15292	2,06543	2,05281	2,22287	2,34102	2,08747	2,04599	2,73691
Shapiro–Wilk statistic																					
sw1z	sw4z	sw5z	sw11z	sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
5,01418	5,75329	7,43367	4,94574	7,60313	4,60961	7,45141	4,83141	5,76318	7,92680	3,12472	2,63463	6,41630	7,11672	7,47552	7,84870	7,97118	7,08559	5,75160	6,20774	5,86326	5,76318
Shapiro–Wilk statistic P-value																					
sw1p	sw4p	sw5p	sw11p	sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00089	0,00421	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
Whites test statistic																					
wwht1	wwht4	wwht5	wwht11	wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
0,93284	1,86215	2,45953	1,37448	5,73257	1,01172	5,14418	0,07514	1,39630	0,63636	0,70012	0,47254	0,12101	1,81326	2,25112	2,61292	2,75578	2,74813	0,11863	3,14387	1,40482	5,54852
Whites test statistic P-value																					
wwhtp1	wwhtp4	wwhtp5	wwhtp11	wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,62724	0,39413	0,29236	0,50296	0,05691	0,60299	0,07638	0,96313	0,49750	0,72747	0,70465	0,78957	0,94129	0,40388	0,32447	0,27078	0,25211	0,25308	0,94241	0,20764	0,49539	0,06240
Norwegian Equity 9 months																					
Durbin-Watson statistic																					
dw1	dw4	dw5	dw11	dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
1,97041	2,21937	2,50575	2,08016	2,10568	1,64253	2,03641	1,64859	2,47995	1,81230	1,92110	1,98538	2,30803	2,24488	2,20286	2,09892	2,06464	2,24344	2,37248	2,08979	2,05161	2,76017
Shapiro–Wilk statistic																					
sw1z	sw4z	sw5z	sw11z	sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
5,05094	5,63468	7,35979	4,73982	7,68493	4,55530	7,30542	4,92504	5,93937	7,87543	2,89643	2,34216	6,53224	7,31408	7,64829	8,03190	8,13826	7,25903	5,86473	6,27574	5,87997	5,93937
Shapiro–Wilk statistic P-value																					
sw1p	sw4p	sw5p	sw11p	sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00189	0,00959	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
Whites test statistic																					
wwht1	wwht4	wwht5	wwht11	wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
1,50200	0,61453	0,80031	3,58138	2,43127	0,31731	3,14140	0,41734	0,11211	0,31312	2,45181	0,70610	0,87534	0,36221	0,33818	0,49415	0,46227	0,63951	0,75752	4,02801	2,16390	7,64882
Whites test statistic P-value																					
wwhtp1	wwhtp4	wwhtp5	wwhtp11	wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,47189	0,73546	0,67022	0,16684	0,29652	0,85329	0,20790	0,81166	0,94549	0,85508	0,29349	0,70254	0,64554	0,83435	0,84443	0,78108	0,79363	0,72632	0,68471	0,13345	0,33893	0,02183
Norwegian Equity 12 months																					
Durbin-Watson statistic																					
dw1	dw4	dw5	dw11	dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
1,97600	2,27074	2,50014	2,07454	2,07636	1,66484	2,03905	1,65326	2,48440	1,81319	2,01271	2,22863	2,30673	2,25150	2,20797	2,10576	2,06490	2,27313	2,38840	1,95303	1,91586	2,72508
Shapiro–Wilk statistic																					
sw1z	sw4z	sw5z	sw11z	sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
4,94062	5,13804	7,28674	4,61358	7,76476	4,60822	7,19714	4,76746	5,69914	7,77930	3,02207	2,34857	6,38978	7,20166	7,54103	7,93506	8,07675	7,24238	5,69037	6,06335	5,69566	5,69914
Shapiro–Wilk statistic P-value																					
sw1p	sw4p	sw5p	sw11p	sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00126	0,00942	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
Whites test statistic																					
wwht1	wwht4	wwht5	wwht11	wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
1,58160	0,54488	3,05397	1,28552	0,45048	0,36575	11,32591	1,21373	0,06297	0,01782	0,76378	0,51424	3,22845	1,12190	0,82690	0,69330	0,46959	0,72722	1,12926	3,37963	1,79330	18,05935
Whites test statistic P-value																					
wwhtp1	wwhtp4	wwhtp5	wwhtp11	wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,45348	0,76152	0,21719	0,52584	0,79833	0,83287	0,00347	0,54506	0,96900	0,99113	0,68257	0,77327	0,19904	0,57067	0,66136	0,70705	0,79073	0,69516	0,56857	0,18455	0,40793	0,00012

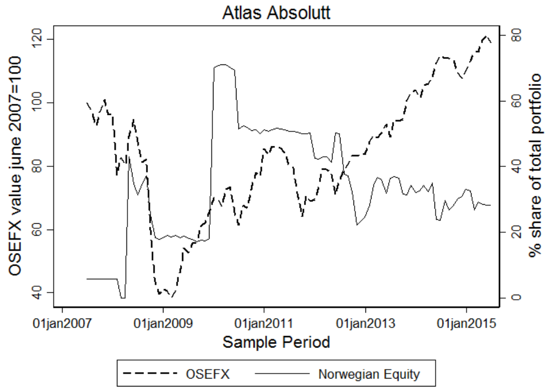
International Bonds 1 month																
Durbin-Watson statistic																
dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw20	dw21	dw22
1,95763	1,69651	2,02856	2,06623	2,62470	1,92301	1,60641	1,72390	1,52485	1,73084	1,52448	1,44448	1,66723	1,65763	1,73606	2,93582	3,01957
Shapiro–Wilk statistic																
sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw20z	sw21z	sw22z
8,05908	8,88645	3,98116	8,27834	8,19543	8,37510	8,65739	8,72157	6,75748	6,63938	6,58169	6,65855	6,91191	7,58512	7,55457	5,83907	8,19543
Shapiro–Wilk statistic P-value																
sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00003	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
Whites test statistic																
wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht20	wwht21	wwht22
0,31547	0,95191	0,29178	0,04260	2,50260	0,82108	0,77672	0,22049	1,86948	1,66951	1,85919	2,27389	1,67316	10,20919	3,85304	3,89977	0,60017
Whites test statistic P-value																
wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp20	wwhtp21	wwhtp22
0,85407	0,62129	0,86425	0,97893	0,28613	0,66329	0,67817	0,89561	0,39269	0,43398	0,39471	0,32080	0,43319	0,00607	0,14565	0,14229	0,74076
International bonds 3 months																
Durbin-Watson statistic																
dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw20	dw21	dw22
1,98872	1,68261	2,08259	2,00991	2,62704	2,01658	1,69203	1,74984	1,54671	1,74696	1,58885	1,47178	1,64536	1,65549	1,76468	2,89571	3,01220
Shapiro–Wilk statistic																
sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw20z	sw21z	sw22z
7,82625	8,85808	4,20133	8,43867	8,10114	8,12837	8,10485	8,61484	6,90469	6,67225	6,68077	6,87259	7,05763	7,49498	7,53798	6,26367	8,10114
Shapiro–Wilk statistic P-value																
sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00001	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
Whites test statistic																
wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht20	wwht21	wwht22
0,20494	0,53993	0,33026	0,30856	1,03195	3,85171	4,06361	3,56177	0,78953	0,50432	0,87011	0,84382	0,83339	6,66814	3,95705	7,14656	0,40382
Whites test statistic P-value																
wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp20	wwhtp21	wwhtp22
0,90260	0,76341	0,84778	0,85703	0,59692	0,14575	0,13110	0,16849	0,67384	0,77712	0,64723	0,65579	0,65922	0,03565	0,13827	0,02806	0,81717
International bonds 6 months																
Durbin-Watson statistic																
dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw20	dw21	dw22
2,02287	1,70138	2,07398	1,97176	2,64202	2,10257	1,80625	2,06634	1,55571	1,75976	1,56117	1,47352	1,64506	1,31772	1,76862	2,35603	3,00932
Shapiro–Wilk statistic																
sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw20z	sw21z	sw22z
7,72838	8,55178	4,03261	8,38030	7,65111	7,88670	7,99128	8,53170	6,87114	6,63949	6,67315	6,77830	6,92637	7,55673	7,43613	6,17486	7,65111
Shapiro–Wilk statistic P-value																
sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00003	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
Whites test statistic																
wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht20	wwht21	wwht22
0,60955	0,47191	2,97996	2,96629	0,03296	7,76157	8,09132	7,65523	1,86887	1,72025	1,94943	2,64217	2,36159	0,91208	4,31150	9,58537	0,74553
Whites test statistic P-value																
wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp20	wwhtp21	wwhtp22
0,73729	0,78982	0,22538	0,22692	0,98366	0,02063	0,01750	0,02176	0,39281	0,42311	0,37730	0,26685	0,30703	0,63379	0,11582	0,00829	0,68882
International Bonds 9 months																
Durbin-Watson statistic																
dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw20	dw21	dw22
1,97933	1,73874	2,10982	1,99500	2,65259	1,93881	1,62098	2,04421	1,56222	1,77209	1,55382	1,48422	1,64716	1,93506	1,77615	2,20776	3,01214
Shapiro–Wilk statistic																
sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw20z	sw21z	sw22z
7,56042	8,46503	3,80132	8,51651	7,68398	8,07768	8,22938	8,67087	6,76571	6,51925	6,57620	6,73997	6,67946	7,01584	7,31233	5,88367	7,68398
Shapiro–Wilk statistic P-value																
sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00007	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
Whites test statistic																
wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht20	wwht21	wwht22
0,63579	0,53033	1,74827	0,82955	1,14886	3,13782	3,37375	4,01511	0,88528	1,23467	1,04535	0,86241	0,93449	1,20179	8,41971	7,71260	0,99960
Whites test statistic P-value																
wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp20	wwhtp21	wwhtp22
0,72768	0,76708	0,41722	0,66049	0,56302	0,20827	0,18510	0,13432	0,64234	0,53938	0,59293	0,64972	0,62673	0,54832	0,01485	0,02115	0,60665
International Bonds 12 months																
Durbin-Watson statistic																
dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw20	dw21	dw22
2,02429	1,69226	2,18828	2,03050	2,62748	1,64601	1,78756	1,86953	1,54200	1,77628	1,54322	1,45431	1,45759	1,99891	1,60612	1,98223	3,01085
Shapiro–Wilk statistic																
sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw20z	sw21z	sw22z
7,31630	8,49589	3,14405	8,36484	7,70057	7,59201	8,33178	8,21050	6,54599	6,28248	6,37185	6,43632	6,36238	6,99748	7,21910	4,96074	7,70057
Shapiro–Wilk statistic P-value																
sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw20p	sw21p	sw22p
0,00000	0,00000	0,00083	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
Whites test statistic																
wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht20	wwht21	wwht22
0,44078	0,23270	2,31571	2,08675	1,04875	1,88330	0,94364	0,39699	2,00673	1,74337	1,91211	2,35564	0,44222	0,62107	5,08034	2,46814	1,66767
Whites test statistic P-value																
wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp20	wwhtp21	wwhtp22
0,80221	0,89016	0,31416	0,35226	0,59192	0,38998	0,62387	0,81997	0,36664	0,41825	0,38441	0,30795	0,80163	0,73305	0,07885	0,29111	0,43438

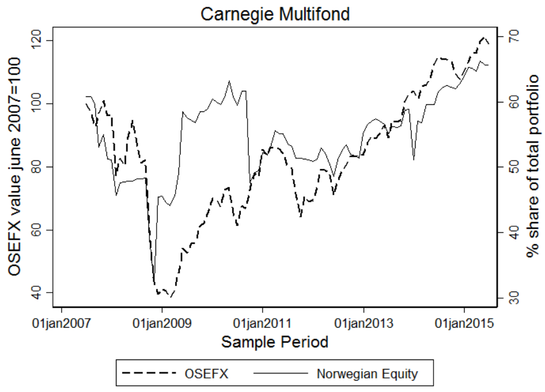
International Equity 1 month																	
Durbin-Watson statistic																	
dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
2,06543	2,26963	2,35122	1,99821	2,24121	2,29634	1,86627	1,83932	2,05203	2,14243	2,17559	2,07854	2,10754	2,23205	2,03194	2,12439	2,98868	2,91988
Shapiro–Wilk statistic																	
sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
4,71680	1,63563	8,33407	8,91753	7,57993	8,13212	3,99756	4,28022	6,54698	7,45645	8,12285	8,55995	8,70675	7,58356	3,81030	5,79450	5,93101	7,57993
Shapiro–Wilk statistic P-value																	
sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,05096	0,00000	0,00000	0,00000	0,00000	0,00003	0,00001	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00007	0,00000	0,00000	0,00000
Whites test statistic																	
wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
3,59878	0,99834	0,90269	0,35116	0,55760	0,22779	7,73500	1,48244	1,23588	9,36263	10,01805	10,54485	10,32220	0,73772	0,75304	0,05131	3,35849	5,09036
Whites test statistic P-value																	
wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,16540	0,60703	0,63677	0,83897	0,75669	0,89235	0,02091	0,47653	0,53905	0,00927	0,00668	0,00513	0,00574	0,69152	0,68625	0,97467	0,18651	0,07846
International Equity 3 months																	
Durbin-Watson statistic																	
dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
2,02967	2,25223	2,33065	2,00277	2,23955	2,26707	1,93505	2,03848	2,07815	2,16817	2,20401	2,09919	2,11439	2,21205	2,00172	1,99910	2,89999	2,99960
Shapiro–Wilk statistic																	
sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
4,70134	2,20369	8,30096	8,80999	7,52590	8,09116	4,15578	3,98146	6,64626	7,72640	8,34540	8,73011	8,85241	7,50559	3,89368	5,96917	5,89561	7,52590
Shapiro–Wilk statistic P-value																	
sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,01377	0,00000	0,00000	0,00000	0,00000	0,00002	0,00003	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00005	0,00000	0,00000	0,00000
Whites test statistic																	
wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
1,34560	1,30347	3,74167	0,61801	0,53018	0,51989	14,47230	9,46406	0,13593	1,68939	2,00467	2,03740	1,99491	1,41232	0,21483	0,01166	6,53482	23,64519
Whites test statistic P-value																	
wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,51028	0,52114	0,15399	0,73418	0,76714	0,77110	0,00072	0,00881	0,93429	0,42969	0,36702	0,36106	0,36882	0,49354	0,89815	0,99418	0,03810	0,00001
International Equity 6 months																	
Durbin-Watson statistic																	
dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
2,04071	2,34573	2,31188	2,01601	2,23325	2,30919	1,92228	2,08063	2,10951	2,21967	2,18879	2,11995	2,13667	2,22474	1,99888	1,98093	2,36744	2,99062
Shapiro–Wilk statistic																	
sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
4,76690	2,15847	8,25646	8,87912	7,35447	8,15930	4,16323	3,68764	6,62793	7,56037	8,07430	8,48760	8,59856	7,52114	3,76941	6,09264	5,81739	7,35447
Shapiro–Wilk statistic P-value																	
sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,01545	0,00000	0,00000	0,00000	0,00000	0,00002	0,00011	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00008	0,00000	0,00000	0,00000
Whites test statistic																	
wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
5,30845	1,86910	4,80935	0,80087	0,49653	0,95367	5,54390	4,58038	1,19761	9,15247	9,98546	10,30114	10,32518	1,34845	1,20368	1,99795	15,14049	1,77767
Whites test statistic P-value																	
wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,07035	0,39276	0,09029	0,67003	0,78015	0,62075	0,06254	0,10125	0,54947	0,01029	0,00679	0,00580	0,00573	0,50955	0,54780	0,36826	0,00052	0,41113
International Equity 9 months																	
Durbin-Watson statistic																	
dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
1,93514	2,42117	2,31194	2,02444	2,26873	2,29772	2,02524	2,04807	2,11280	2,19814	2,14438	2,08740	2,08961	2,21897	1,71184	1,97747	2,27298	2,99582
Shapiro–Wilk statistic																	
sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
4,84189	1,92727	8,14956	8,88472	7,51173	8,20516	4,34372	4,08667	6,55032	7,75815	8,28338	8,63319	8,76071	7,45958	1,60913	6,09983	5,60363	7,51173
Shapiro–Wilk statistic P-value																	
sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,02697	0,00000	0,00000	0,00000	0,00000	0,00001	0,00002	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,05379	0,00000	0,00000	0,00000
Whites test statistic																	
wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
5,84389	1,05022	7,14070	0,76174	1,80263	0,27173	2,31029	2,12375	4,54839	1,56552	1,47258	1,41212	1,33989	0,80311	0,65136	10,45647	12,81283	1,58062
Whites test statistic P-value																	
wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,05383	0,59149	0,02815	0,68327	0,40604	0,87296	0,31501	0,34581	0,10288	0,45714	0,47889	0,49358	0,51174	0,66928	0,72204	0,00536	0,00165	0,45371
International Equity 12 Months																	
Durbin-Watson statistic																	
dw3	dw6	dw10	dw18	dw2	dw7	dw8	dw9	dw12	dw13	dw14	dw15	dw16	dw17	dw19	dw20	dw21	dw22
1,95533	2,44981	2,31610	2,01959	2,26777	2,29618	2,16482	2,16075	2,11417	2,19575	2,14824	2,08548	2,08610	2,21941	1,70289	1,81174	2,13162	2,99127
Shapiro–Wilk statistic																	
sw3z	sw6z	sw10z	sw18z	sw2z	sw7z	sw8z	sw9z	sw12z	sw13z	sw14z	sw15z	sw16z	sw17z	sw19z	sw20z	sw21z	sw22z
5,06300	1,68637	8,01818	8,81034	7,40203	8,12410	4,48349	4,24255	6,43025	7,71213	8,27574	8,58955	8,71561	7,35346	1,19124	5,94969	5,02676	7,40203
Shapiro–Wilk statistic P-value																	
sw3p	sw6p	sw10p	sw18p	sw2p	sw7p	sw8p	sw9p	sw12p	sw13p	sw14p	sw15p	sw16p	sw17p	sw19p	sw20p	sw21p	sw22p
0,00000	0,04586	0,00000	0,00000	0,00000	0,00000	0,00000	0,00001	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,11678	0,00000	0,00000	0,00000
Whites test statistic																	
wwht3	wwht6	wwht10	wwht18	wwht2	wwht7	wwht8	wwht9	wwht12	wwht13	wwht14	wwht15	wwht16	wwht17	wwht19	wwht20	wwht21	wwht22
0,11051	0,69556	16,15065	0,61864	3,02894	0,48377	3,06504	5,37839	6,05790	1,68597	1,46292	1,25420	1,14095	1,15201	0,29143	5,05003	2,26395	1,67393
Whites test statistic P-value																	
wwhtp3	wwhtp6	wwhtp10	wwhtp18	wwhtp2	wwhtp7	wwhtp8	wwhtp9	wwhtp12	wwhtp13	wwhtp14	wwhtp15	wwhtp16	wwhtp17	wwhtp19	wwhtp20	wwhtp21	wwhtp22
0,94625	0,70625	0,00031	0,73395	0,21992	0,78515	0,21599	0,06794	0,04837	0,43042	0,48121	0,53414	0,56526	0,56214	0,86440	0,08006	0,32240	0,43302

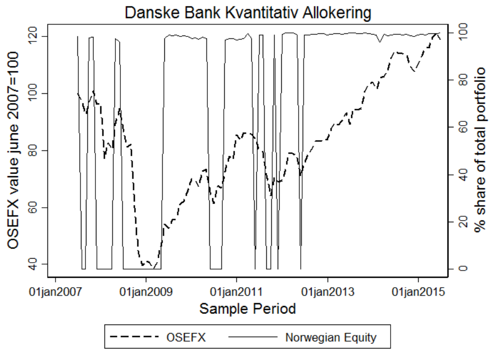
10.1.14 Case study financial crisis

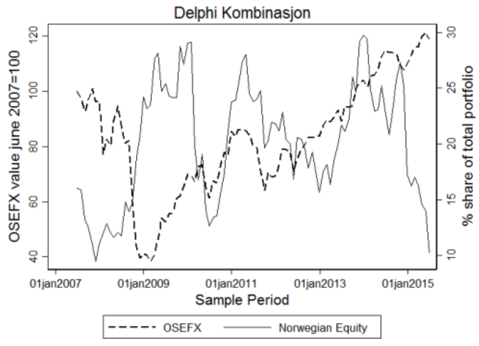


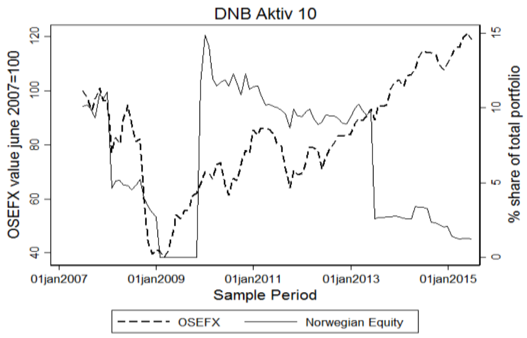


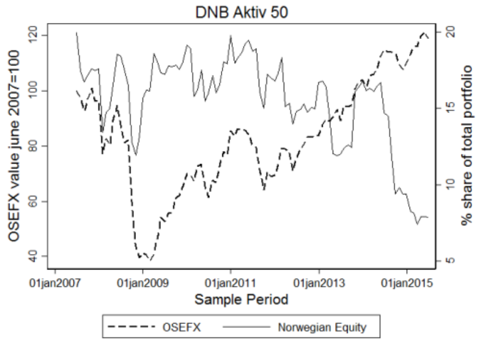


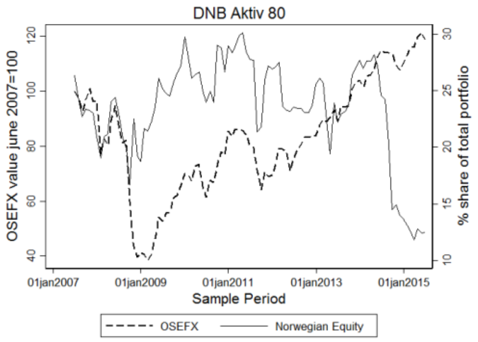


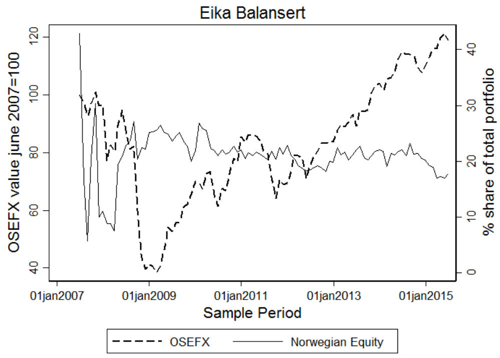


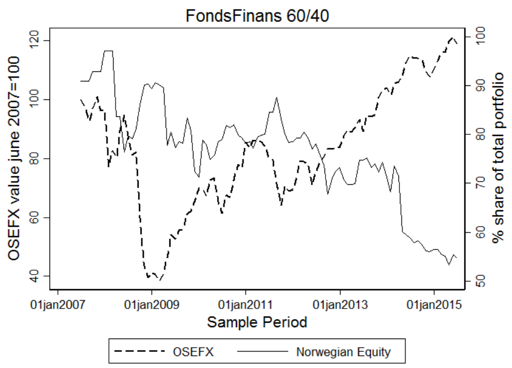


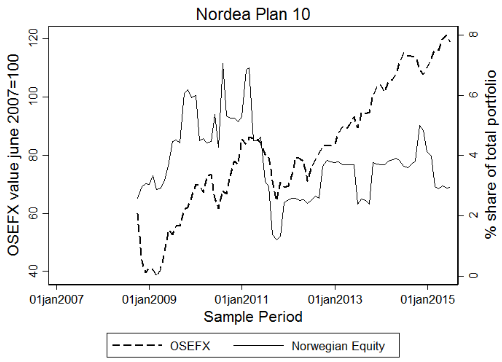

DNB Aktiv 10
OSEFX value june 2007=100
% share of total portfolio
01jan2007 01jan2009 01jan2011 01jan2013 01jan2015
Sample Period
OSEFX
Norwegian Equity

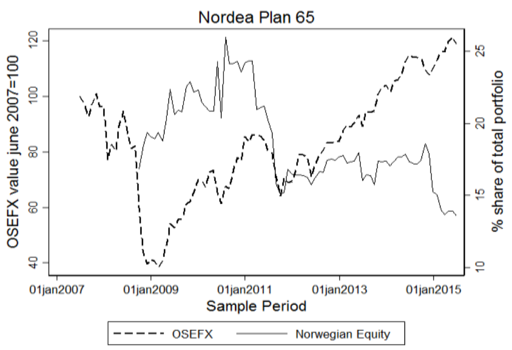

DNB Aktiv 50
OSEFX value june 2007=100
% share of total portfolio
01jan2007 01jan2009 01jan2011 01jan2013 01jan2015
Sample Period
OSEFX
Norwegian Equity

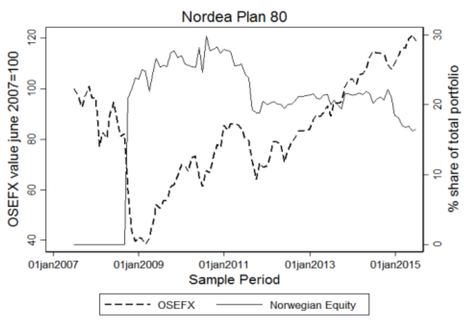

DNB Aktiv 80
OSEFX value june 2007=100
% share of total portfolio
01jan2007 01jan2009 01jan2011 01jan2013 01jan2015
Sample Period
OSEFX
Norwegian Equity

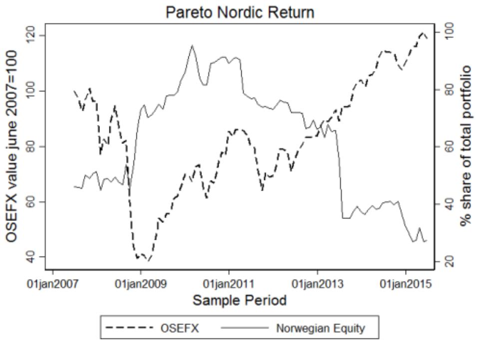

Eika Balansert
OSEFX value june 2007=100
% share of total portfolio
01jan2007 01jan2009 01jan2011 01jan2013 01jan2015
Sample Period
OSEFX
Norwegian Equity

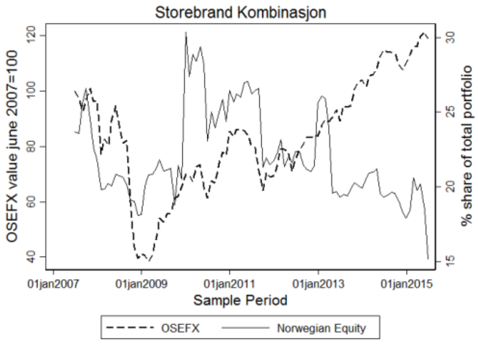

FondsFinans 60/40
OSEFX value june 2007=100
% share of total portfolio
01jan2007 01jan2009 01jan2011 01jan2013 01jan2015
Sample Period
OSEFX
Norwegian Equity

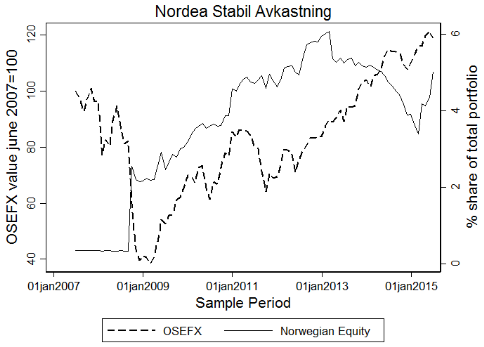

Nordea Plan 10
OSEFX value june 2007=100
% share of total portfolio
01jan2007 01jan2009 01jan2011 01jan2013 01jan2015
Sample Period
OSEFX
Norwegian Equity

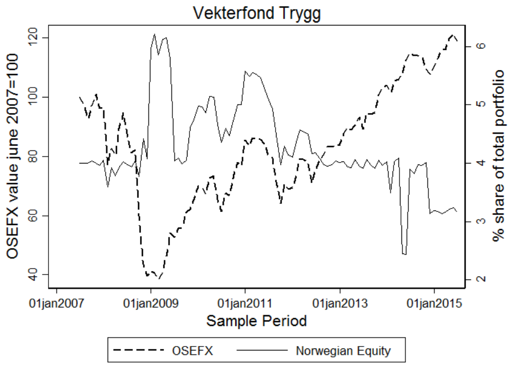

Nordea Plan 65
OSEFX value june 2007=100
% share of total portfolio
01jan2007 01jan2009 01jan2011 01jan2013 01jan2015
Sample Period
OSEFX
Norwegian Equity

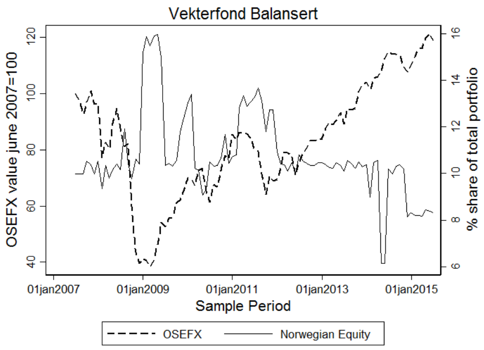

Nordea Plan 80
OSEFX value june 2007=100
% share of total portfolio
01jan2007 01jan2009 01jan2011 01jan2013 01jan2015
Sample Period
OSEFX
Norwegian Equity

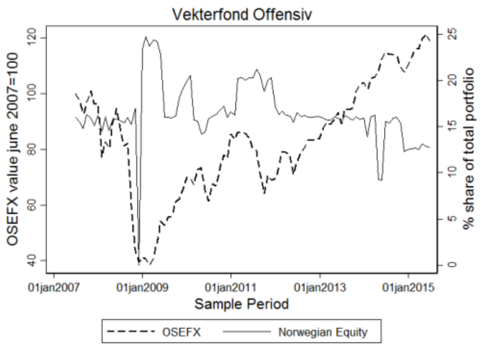

Pareto Nordic Return
OSEFX value june 2007=100
% share of total portfolio
Sample Period
OSEFX
Norwegian Equity


Storebrand Kombinasjon
OSEFX value june 2007=100
% share of total portfolio
Sample Period
OSEFX
Norwegian Equity


Nordea Stabil Avkastning
OSEFX value june 2007=100
% share of total portfolio
Sample Period
OSEFX
Norwegian Equity


Vekterfond Trygg
OSEFX value june 2007=100
% share of total portfolio
Sample Period
OSEFX
Norwegian Equity


Vekterfond Balansert
OSEFX value june 2007=100
% share of total portfolio
Sample Period
OSEFX
Norwegian Equity


Vekterfond Offensiv
OSEFX value june 2007=100
% share of total portfolio
Sample Period
OSEFX
Norwegian Equity