Masteroppgave

Performance Evaluation of Norwegian Equity Funds 1998-2008

Av

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Masteroppgaven er gjennomført som et ledd i utdanningen ved Universitetet i Agder og er godkjent som sådan. Denne godkjenningen innebærer ikke at universitetet innestår for de metoder som er anvendt og de konklusjoner som er trukket.

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Foreword

This thesis, "*Performance Evaluation of Norwegian Equity Funds 1998-2008*", is written as a part of Master of Science degree in Business Administration at the Univeristity of Agder.

The process of writing this thesis has been unique adventure for us since we live in different countries and all communication among us was limited by email, chat programs and phone conversations. We believe that this aspect has brought us some invaluable team work experience.

We would like to thank our supervisors Valeri Zakamouline and Steen Koekebakker for guiding us through the process, encouraging us and providing advice. Our appreciation goes to employees at Oslo Børs, Alfred Berg Kapitalforvaltning, DNB NOR Kapitalforvaltning and Carnegie Kapitalforvaltning for being helpful and responsive to our various enquiries. Our thanks goes to Frode Sættem for advice on market timing.

We would like to send especially warm thanks to our co students and friends Helga Emblemsvaag and Toril Eikrem for comments and proof reading.

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Abstract

The purpose of this thesis is to evaluate the performance of Norwegian equity funds during the period from 1998 to 2008. We have identified the best and the worst performing funds during the period based on five performance measures: Sharpe ratio, Treynor ratio, Jensen's Alpha, Appraisal ratio and Modigliani and Modigliani measure. The analysis focuses on the funds' performance in the form of risk-adjusted return. We compare the performances of the funds, and investigate whether they achieve a higher risk-adjusted excess return than the market benchmark, as well we check if equity funds hold the risk profile they claim to have in their prospects.

The performance evaluation methods used to rank the mutual funds have given results with strong positive correlation. The funds with the best performance according to the majority of the performance measures were Alfred Berg GAMBAK, ODIN Norge and Storebrand Verdi.

The results show that none of the 36 funds generate a significant positive risk-adjusted excess return above the market. Most of the funds' risk profiles were strikingly low as compared to the market benchmark, despite the fact that they claim to have high risk portfolio. We also observed that individual funds within the same management company had a similar risk profile.

Further we examine funds' performance persistence and funds' stock picking and market timing ability. We come to conclusion that there is no performance persistence during the observation period among Norwegian equity funds. When it comes to market timing ability we identify 1 fund out of 36 that exhibits positive market timing ability for both tests we employ. We conclude that market timing ability is rare and we can confirm the validity of Efficient Market Hypothesis in Norwegian stock market.

We have identified that funds of larger management companies did, on average, by 20% better than funds from companies whose assets under management did not exceed 15 bn NOK.

Finaly, we investigate whether change in ownership of management company has an effect on fund performance, we concentrate especially on acquisition of stand-alone companies by larger financial groups. We conclude that change in ownership has an impact on funds' performance and it seems to have the same effect (positive or negative) on all the acquired company's funds. However, we do not find any evidence that independent stand-alone companies performance tend to deteriorate after being bought by big financial groups. We find that two companies did improve their results while the performance of other two deteriorated after acquisition.

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1 Introduction

There has been an incredible growth in the number of mutual funds and the total assets under their management in the last two decades in Norway. Since mutual funds have become a part of everyday life for an average Norwegian we would like to look closer at the results mutual funds have exhibited during the last decade.

We approach this problem by investigate the performance and efficiency of Norwegian equity funds in period 1998-2008.

First of all, we rank the funds that have been around the whole decade using different performance measures: Sharpe ratio, Treynor ratio, Jensen's Alpha, Appraisal ratio and Modigliani and Modigliani measure, thus identifying the best and worst funds of the decade.

We compare the performances of the funds, and investigate whether they achieve a higher risk-adjusted excess return than the market benchmark, as well we examine the risk profiles of the funds and check if equity funds hold the risk profile they claim to have in their advertisement brochures.

Secondly, we carry out performance persistence tests to see whether investors could build a strategy that would bring him or her extra returns by looking at the past performance of funds. We also investigate whether Norwegian equity funds exhibit any market timing and stock picking abilities by employing Treynor, Mazuy and Henriksson ,Merton tests. Existence of such abilities would put in doubt the validity of Efficient Market Hypothesis for Norwegian stock market.

Further we investigate whether size of management company has an effect of exhibited performance. We proceed by dividing management companies in 2 groups according to their size and looking at the average performace of each of the group's funds.

Finaly, we investigate the affect of the change of management company's ownership to funds' performance. We concentrate on stand-alone companies who were bought up

during our sample period. We estimate and analyze performance measures of the funds three years before and three years after acquisition takes place.

We start our paper with insight in mutual fund industry by looking at the developments in Norwegian mutual fund market. In 3rd part we provide our reader with more information on mutual funds, namely, reasons for investing in funds, fund types and regulatory framework. As investing in equity funds inevitably involves risk we devote section 4 to exploration of this phenomenon. In part 5 we outline the theoretical background that is needed to achieve the goals of this paper followed by methodological implications in section 6. Part 7 of this paper we devote to the description of data we employ in our tests. In part 8 we present our findings and section 9 concludes our thesis.

2 Norwegian Mutual Fund Industry

Mutual funds play an important role as a vehicle for ever-increasing amounts of individual investor savings. There has been an incredible growth in the number of mutual funds and the total assets under their management in the last two decades in Norway. However, Norwegians stay far behind other European and Scandinavian countries when it comes to percentage of personal wealth invested in equities. Mutual fund assets equal approx. 6 percent of total household financial assets in Norway in 2007, and 1, 4 millions Norwegians were shareholders in equity funds. The percentage of personal wealth invested in mutual funds, was around 26 in Sweden at the same time. Securities funds are collective investment scheme and independent legal entities. Capital invested in securities funds is not affected in the event of the management company's failure. In light of the law's strict requirements with respect to risk diversification and frequent valuations, only bank deposits are as thoroughly regulated as investment funds.

At the end of 2007, 23 companies were licensed to manage securities funds whereas 20 of these 23 are also members of the Norwegian Mutual Fund Association (NMFA). At the end of 2006, NMFAs members had a total capital under management of NOK 343 billion. NOK 142 billion is attributed to the household sector. The total number of funds managed by NMFA members is approx. 500. Figure 2.1 illustrates the net subscription in mutual fund during 2003-2007. We can see an increase from about NOK 19 milliards in 2003 to NOK 58 milliards in 2007. As shown in the figure, it was a decline in net subscription from 2005 to 2006. One of the reasons could be that investments in mutual funds decrease the income tax,

but from 2006 the percentage of deduction from income tax has been decreased. However, we can observe that the growth in subscription in mutual fund varies from year to year.

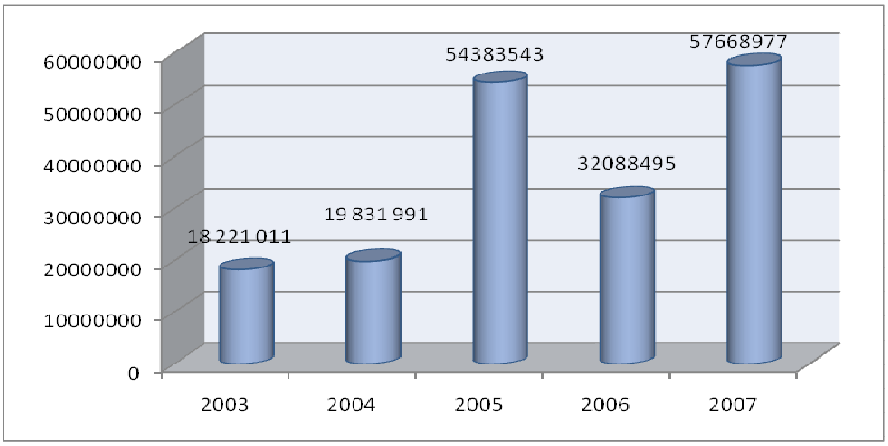

Figure 2.1 Net subscription in mutual funds(Source: Norwegian Mutual Fund Assosiation)

Management companies' aggregate operating profit was NOK 1.5 billion in 2007, about the same as in 2006. Management companies' revenues largely consist of fees for managing securities funds.

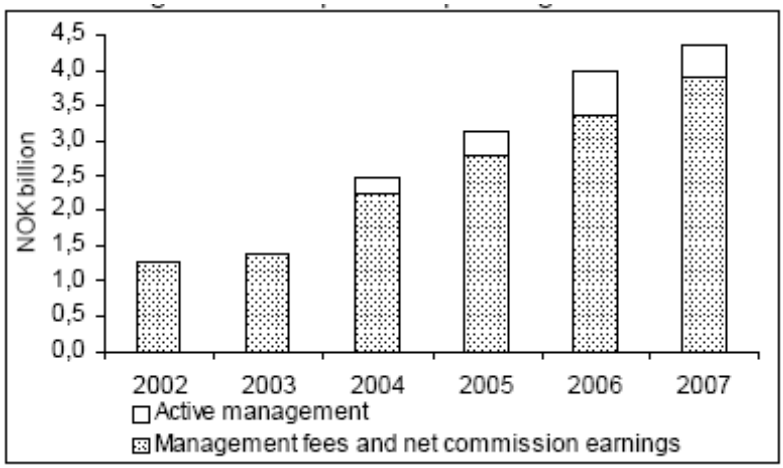

Figure 2.2 Management companies operating revenues(Source: Kredittilsynet)

At the end of 2007, capital under active management totalled NOK 487 billion, an increase of NOK 34 billion over the previous year. Assets under management in Norwegian securities funds rose by NOK 65 billion to reach NOK 403 billion at the end of 2007.

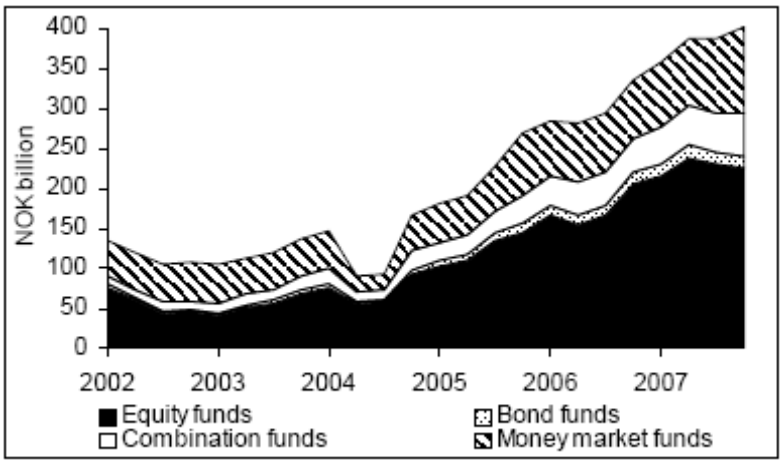

Figure 2.3 Total assets on securities funds (source: Kredittilsynet)

2.1 Norwegian Equity Funds Market

Our main focus in this thesis is on Norwegian equity funds who invest at least 80% of their portfolio in Norwegian stock market. The market for Norwegian equity funds has not experienced the same growth rate that the whole mutual funds industry in Norway has. Norwegian equity funds market has undergone many changes during the last decade. The capital under management by Norwegian equity funds has increased from NOK 32, 5 billion to 53 NOK billion from 1998 to 2007. However, the total funds market share of Norwegian equity funds has considerably declined from 38% to 13 %. This clearly reflects the investors' shift of preferences from domestic to international equity funds. Number of funds varies greatly from year to year, e.g. in 1998 there were 81 funds classified as Norwegian equity funds, while the number plummeted to 65 in 1999. In 2007 there were registered 71 Norwegian equity funds. During the last decade the industry has become more consolidated as in 1998 there were 25 companies managing Norwegian equity funds while in 2007 the number had reduced to 18 (and respectively equity fund managers from 26 to 20).

DnB Nor Kapitalforvaltning is the clear market leader in Norwegian Equity funds with 25 % market share, however it is just the 3rd biggest player in the total equity fund market in Norway where the market leader is SKAGEN with 30 % market share (source: www.vff.no).

3 General about Mutual Funds

Mutual funds represent a collective investment offered by professionally managed investment companies. Private investors pool their resources to spread their money over a wide variety of securities. Fund management companies mange these securities on behalf of the shareholders, and each investor hold a prorated share of the total funds according to the size of their investments. It is very expensive in terms of brokerage and trading costs to achieve a diversified portfolio for the average individual investor. By investing in mutual funds they gain the advantage of large-scale trading without needing to constantly monitor the market. Investors pay different fees like management fee, subscription fee and redemption fee, these costs can differ from one company to other.

3.1 Different Types of Fund

Equity funds are divided into various groups depending on which investment universe the Funds' investment mandates require them to invest in. The investment universe may be limited geographically, limited by business sectors(investments in particular industries) or it may be a combination of the two (source: www.oslobørs.no).

NMFA defines different types of mutual funds, but there are four main fund types, classified by investment policy.

3.1.1 Equity Funds

Norwegian Mutual Fund Association defines a mutual fund, as a fund that will invest at least 80% of funds portfolio value in shares. They can invest in fixed income securities, but not more than 20 % of total portfolio value. Stock or Equity funds invest primarily in stocks, but also may hold fixed-income or other types of securities. Funds commonly will hold between 4% and 5% of total assets in money market securities to provide liquidity necessary to meet potential redemption of shares. Stock funds are the most common fund investment for the average Norwegian investor. Different mutual funds groups have been established in Norway such as Norwegian funds, Swedish funds, Norwegian/international funds, Nordic funds, European funds, Asian funds, Global funds, Regional funds, sector funds like Finance fund, Health funds, Technology funds etc..

3.1.2 Bond Funds

Bond funds invest primarily in bonds or other types of debt securities. The securities held by bond funds have longer maturities than money market fund's securities. Bond funds specialize in the fixed-income sector with a considerable room for specialization within the sector. Bond funds are either taxable or tax exempt, depending on the securities in which the fund invests. For instance, different funds will focus on corporate bonds, Treasury bonds, mortgage-backed securities, or tax-free bonds. The securities that bond funds hold will vary in terms of risk, return, duration, volatility and other features. A common misconception among some investors is that bonds and bond funds have little or no risk, but they are subject to credit risk, prepayment risk and interest rate risk. However, they entail less risk than equity funds.

3.1.3 Money Market Funds

Money market funds invest in debt securities that mature in 13 months or less, and the average maturity of all their holdings may not exceed 90 days (Pozen,2002). These funds have relatively low risks compared to other mutual funds and pay dividends that generally reflect short-term interest rates. Money market funds typically invest in government securities, certificates of deposits, commercial paper of companies, and other highly liquid and low-risk securities. They usually offer check-writing features, and net value is fixed per share, so that there are no tax implications such as capital gains or losses associated with redemption of shares.

3.1.4 Hybrid Funds

Hybrid funds – such as balanced or asset allocation funds-invest in a combination of equity, debt and other securities. The combination for balanced funds is generally about 60% in equity securities and 40% in debt securities both short and long term. Other asset allocation funds invest in a mix of equity and debt securities, and may change that mix from time to time within stated parameters. Hybrid funds give investors a unique possibility for achieving diversification across equity and fixed income securities. This portfolio composition keeps the fund from dropping considerably in a down market. Unfortunately, it also doesn't appreciate as quickly in an up market. Ultimately, higher proportion of stock investments will generate higher returns at a cost of higher risk.

The market shares of different types of funds that are managed by NMFA members (shares of total capital under management) are as follows:

- Equity funds: 61 %
- Balanced funds: 5 %
- Bond funds: 12 %
- Money market funds: 22 % (source: www.vff.no)

3.2 Reasons for Saving in Mutual Funds

As mentioned before there are several reasons for investing in mutual funds. Mutual funds offer investors the advantage of portfolio diversification and professional management at a low cost. These advantages are particularly important in the case of equity funds where both diversification and professional management have the potential to add value. For bond and money market mutual funds, the main advantage is transactional efficiency through professional management. The tax incentives and regulatory have also played a role in development of bond and money market funds. There are three tax benefits by investing in mutual funds; tax-free returns, long run tax credit and reduced net wealth tax. Tax-free return: one part of returns on mutual funds is totally tax free; the part of returns which exceed the risk free rate of return is taxable.

Long run tax credit means that investors do not have to pay tax on the part of returns exceeding risk-free rate of interest before selling their shares. As long investors do not move their invested capital the tax amount will be outstanding in the mutual fund and will give them even more return in long run. Reduced net wealth tax: shares in mutual fund and the most combination funds get 15 percent deduction in net wealth tax from financial year 2007.

The other advantage is the high level of operational transparency comparing to other financial institutions such as banks, insurance companies and pension funds. Unlike banks and insurance companies, mutual funds do not assume credit and insurance risks and thus do not need to make subjective provisions against non-performing loans or to create actuarial reserves against future insurance claims. Mutual funds invest in marketable instruments and are able to follow a “mark-to-market” valuation of their assets. But investors bear the investment risk, especially for equity funds when investors participate in

the upside potential of equities but are also exposed to substantial losses when markets are falling.

Mutual funds require a strong and effective regulatory framework, and investors are protected from fraudulent behavior of funds mangers. Funds investors rely on the advertised investment strategies of mutual fund when selecting their funds. It is therefore of great importance that managers follow their declared objectives and advertised strategies. Accounting and auditing rules, information disclosure and transparency requirements are essential and ensure investor protection. Mutual funds also require well-developed securities markets with a high level of market integrity and liquidity. Market liquidity ensures that transactions costs are low. Market integrity means that insiders are barred from taking advantage of privileged information, while large shareholders and market intermediaries are prohibited from engaging in market manipulation (Deepthi, Klapper, Sulla, Vittas, 2003).

3.3 Norwegian Regulations

The fund management companies must act in the interest of the investors and are strictly regulated by the Norwegian Security Exchange Commission.
Norwegian Mutual Fund Association (NMFA) has adopted mandatory industry standards for its members on many different issues, for instance, how the funds set up the portfolio to secure a diversification. It also stipulates the number of companies a fund has to invest in, and the maximum share of one company in the mutual fund's portfolio. Investment funds have to ensure a high degree of transparency. The fund must disclose information on the areas and industries the fund is investing in, and all types of costs must be publicly available.

Fund management is subject to the Norwegian Securities Fund Act, Companies Act and a number of other regulations. In addition, the management company is subject to regulations regarding internal audits. It is the task of the Financial Supervisory Authority of Norway to supervise all institutions in the securities market, and it is the guarantor for people who save through funds that all activities are conducted properly. Simply put, the Commission ensures that the securities market functions well both as a source of capital for business, and for investors. Management companies must submit monthly reports to the Financial Supervisory Authority of Norway, which in turn follows up with local audits

to review operations, procedures and the organization. The results of such audits are publicly available information. (source: www.skagenfondene.no)

3.4 UCITS

Undertakings for Collective Investment in Transferable Securities (UCITS) are a set of European Union directives which has been the basis for an integrated market facilitating the cross-border offer of collective investment funds. These rules allow collective investment schemes to operate freely throughout the EU on the basis of a single authorization from one member state.The regulation recognizes that each country within the European Union may differ on their specific disclosure requirements.A collective investment fund may apply for UCITS status in order to allow EU-wide marketing. With a larger market the economies of scale will reduce costs for investment managers which can be passed on to consumers. UCITS induces EU wide competition among mutual funds that is beneficial to investors by increased efficiency of fund management.

The UCITS Directive has been, due to the EEA agreement, implemented in Norway through the Norwegian Securities Funds Act. It follows from this directive that UCITS funds approved in one EEA country may be marketed in the other EEA countries. Throughout Europe approximately €5 trillion are invested in collective investment vehicles. Of these funds about 70% are UCITS. (Source: www.euractive.com).

3.5 Global Investment Performance Standards

The GIPS standards are a set of standardized, industry-wide ethical principles that apply to the way investment performance is calculated and presented to prospective clients. The investment management industry is becoming more global. Many asset managers not only compete for business in their home markets, but in foreign markets as well. The North American and Western European markets are very well developed, but it is not the fact for other markets. For investment firms outside the U.S. or European Union, compliance with GIPS provides a high level of credibility to the calculation and presentation of investment performance history bringing both marketing and internal control advantages. Being a GIPS compliant firm demonstrates an acceptance of ethical standards, transparency and integrity. These are valuable qualities for firms considering dealing with other people's money.

Today, 25 countries throughout North America, Europe, Africa, and Asia Pacific have adopted the GIPS standards, encouraging investment management firms to follow the Standards. In January 200, The Norwegian association of financial analysts decided to replace the Norwegian standards from 1996 with GIPS.

3.6 Active versus Passive Management

3.6.1 Active Fund Management

Companies, who manage funds actively, believe that markets are not fully efficient and one can find undervalued stocks. Usually two methods are used fundamental and/or technical analysis to select individual securities in an effort to achieve higher returns or outperform "the market" represented by a benchmark index.

The active portfolio management is responsible for day to day buy and sells decisions in the fund. In order to outperform the relevant benchmark actively managed mutual funds uses different methods such as security selection and sector weighting. Security selection refers to buying large positions in certain securities in the benchmark, and sector weighting means overwriting or underwriting sectors in the benchmark. Companies following fundamental analysis may use a *top-down* approach where managers first analyze the macroeconomics trends in the market to identify attractive sectors, industries and securities. The decision about the selection of individual securities comes at the end of this process. Conversely, a *bottom-up* investor ignores broad sector and economic conditions and instead focuses on selecting a stock based on the individual attributes of a company. They seek securities with attractive investment prospects regardless of industry or macroeconomic factors. They may require some minimum values for profitability, growth rate or a maximum level of a P/E ratio. The bottom-up approach assumes that individual companies can do well even in an industry that is not performing very well. Companies employing technical analysis will follow the price changes and will try to indicate trends in market. Technicians assume that stock prices are based more on social psychology than real underlying values, thus they try to identify patterns in past stock prices that might indicate the future price movements. Technical analysis is seldom used alone, most asset management companies develop their own mixture of fundamental and technical analysis based on which they pick stocks whose price is going to rise in the future.

3.6.2 Passive Fund Management

Index mutual funds are passively managed; their strategy is to construct portfolios that will match the risk/ return profiles of underlying market benchmarks. Passive managers try to minimize the tracking error, or the deviation of the funds return from the return of the index. This may be done by two methods: full replication which is purchasing the entire component securities of the index in identical proportions to the index; and sampling, where managers often purchase statistically representative sample of securities whose combined total return and volatility approximate that of the index. Index funds have lower management fees and total expense because the trading required to keep portfolios in line with underlying indices is generally less than that required to "beat" the indices and there is no need to employ security analyst. The number of securities covered by passive mangers is almost unlimited due to relegation of stock selection and portfolio construction problem to the fast-acting computers (Pozen,2002).

Passive investment management used by *equity index fund* is based on efficient market hypothesis (EMH). EMH states that stock prices already reflect all publicly available information and the new information are instantly absorbed in stock prices. According to EMH supporters, it is almost impossible to outperform the market through active management and stock selection based on research. This is due to the difficulty of obtaining new information about stock prices before anyone else. Academic studies suggest that index funds outperform a majority of actively managed mutual funds with similar risk. Expenses and transaction costs account for most of the differences between the passive and active investing over the long term. On the other hand, these studies focus on the most liquid and closely followed portions of the U.S. stock markets. Indices are easier to outperform in other market segments, like small cap stocks or developing countries where companies are not monitored by hundreds of analysts, thus there is a time lag between new information and price reaction that allows for profitable investments.

4 Risk and Return

The return on mutual funds includes both income (in the form of dividends or interest payments) and capital gain or losses (the increase or decrease in the value of a security) (Simons,1998). All investment decisions involve a trade-off between risk and return. The capital asset pricing model posits that return and risk are positively related- higher return carries higher risk. Investors cannot expect higher return, without being willing to assume larger risks. According to Haslem (2003), Empirical test of CAPM generally find that the trade-off relationship between expected return and risk is an upward positively sloped straight line. The general nature of this trade off was also confirmed in Baker et al. (1977).

Mutual fund shares are priced daily at net asset value, which, as noted, is computed by taking total market value of the portfolio, less fund liabilities, and dividing the reminder, by number of outstanding shares. Shares are sold and redeemed at NAV; they are sold directly to investors or indirectly through sales agents (Haslem, 2003).

According to Simons (1998), funds return can be expressed as changes in a fund's net asset value, assuming the reinvestment of all income and capital-gains distributions, and dividing it by the original net asset value.

4.1 Arithmetic Average

Arithmetic mean is the simple average of rate of returns, equal to the sum of all the returns divided by the total number of periods. The Arithmetic mean measures the return of an investment that is held constant at the initial level. It can be calculated as follows:

$$r_A = \frac{r_1 + r_2 + ...r_N}{N}$$

where

- r_A the arithmetic average;
- $r_1, r_2 \ldots r_N$ are the return in different periods;
- N is the number of periods.

The average is used to forecast future rate of returns because of its unbiased property. However, for forecasts of cumulative returns over long horizons, the arithmetic average is inadequate.

4.2 Geometric Average

As a descriptive measure of historical return, the geometric average provides an annualized measure of the proportional change in wealth that actually occurred over the time horizon being analyzed, as if the wealth grew at a constant rate of return equal to the geometric mean. In other words, geometric average measures the return of an investment that grows in each period at precisely the rate of return of the portfolio.

The geometric mean of monthly returns can be expressed as follows:

$$R = \sqrt[T]{\prod(1+R_t)}$$

where

- Π th multiplication factor, terms of $(1+R_t)$ multiplies by each other;
- R geometric mean for the period of T months;
- T number of periods.

Arithmetic average and geometric average of monthly return for a period of time will differ from each other. The relationship between geometric mean return and arithmetic mean can be approximated with the following expression:

$$R_G = R_A - \frac{1}{2}\sigma^2$$

where

- R_G is the geometric mean return;
- R_A is the arithmetic mean return;
- σ^2 is the variance of returns.

This formula shows that the larger the volatility, the larger the difference between the arithmetic and geometric mean returns. Further, one can deduce from the above expression that the geometric mean return will always be smaller than the arithmetic average return, as long as returns are not constant.

Jacquier, Kane, and Marcus (2005)show that a proper measure for long horizons is a mix of a weighted average of the arithmetic and geometric historical averages.

4.3 Excess Return

Investors evaluate returns of a mutual fund in comparison to some alternative investments. To be considered, a fund should meet some minimum hurdle, such as a return on a completely safe, liquid investment available at the time. This return is called risk-free rate of return, and usually is the rate on 90-day Treasury bills. A fund's monthly return minus

the monthly risk-free rate is called the funds monthly excess return (r_p-r_f). Rate of return in excess of risk free rate is not the only alternative for comparing funds return with other investments. Domestic fund are compared to the market indices like OSEFX in Norway and S&P 500 which is the most widely used benchmark for diversified equity funds. For some type of funds, other benchmark may be more appropriated.

4.4 Standard Deviation

The basic measure of variability is the standard deviation (volatility), and it is computed as follows:

$$STD=\sigma=\sqrt{1/T*\sum(R_t-AR)^2}$$

where

- STD the monthly standard deviation;
- AR the average monthly return;
- T the number of months in the period for which the standard deviation is being calculated.

The monthly standard deviation can be annualized by multiplying it by the square root of 12. The standard deviation of excess returns over the risk-free rate is also used to measure a mutual fund's risk. The standard deviation of the difference in returns between the fund and the appropriate bench mark index is also interesting for mutual fund companies. This enables them to measure how well their mangers are able to track the returns on some benchmark index related to the fund's announced purpose.

Standard deviation is sometimes criticized because investors do not dislike variability per se. As a consequence, a more recently developed measure is down side risk, which takes account of losses but not of gains. This can be calculated as follows (Simons, 1998):

1. Count the number of months when the fund lost money or when excess returns were negative;
2. Sum these negative excess returns;
3. Divide the sum by the total number of months in the measurement period.

While down side risk might reflect investor's attitudes towards risk better than standard deviation, empirical evidence shows that those two measures are highly correlated, since the pattern of past performances of well-diversified portfolios tend to be symmetric and

thus the differences are not of great importance. There are several approaches how to measure risk, but unfortunately none of those can give a complete definition of risk. Or as former chairman of US Federal Reserve Alan Greenspan postulates, "we will never have a perfect model of risk." (Source: www.ft.com)

4.5 Risk

Fund's returns are not the only interesting factor for investors, the risk taken to achieve those returns is also important. Risk often focuses on portfolio risk (mutual funds) as well as security risk. Risk is defined in different ways, one of those is the uncertainty of the expected return, and uncertainty is usually equated with variability. Investors demand and receive higher returns with increased variability. Risk can also be defined as possibility of suffering harm or loss, since we would not perceive variability that brings greater returns as a risk.

In portfolio context, relevant risk is not an asset's own risk, but its effect on portfolio systematic risk. Investors are not rewarded with a risk premium for bearing the unsystematic risk. They are just rewarded for assuming the risk that can not be eliminated through diversification. Empirical evidence shows that markets price securities based on a linear relationship between systematic risk and return. The roll of the unsystematic risk in the market pricing mechanism is small (Haslem, 2003).
The total risk of a portfolio can be expressed as follows:

$$\sigma_i^2 = \beta_i^2 \sigma_M^2 + \sigma_\varepsilon^2$$

where

- σ_i^2 The variance of the portfolio;
- β_i Systematic risk of the portfolio;
- σ_M^2 The variance of the market portfolio;
- σ_ε^2 The variance of the portfolio's random error.

This equation tells us that the total risk consists of two components with covariance of zero;

- Systematic variance ; $\beta_i^2\sigma_M^2$, due to the uncertainty of common macroeconomic factors;
- Unsystematic variance; σ_ε^2, due to firm-specific uncertainty.

The systematic variance depends on the sensitivity coefficients of the individual securities, and this part of the risk cannot be diversified no matter how many stocks are held. Systematic risk is caused by broad market factors impacting most securities such as monetary policy, inflation, tax policy, economic outlook and market outlook. The unsystematic risk component is attributable to firm-specific events such as financial strength, earnings outlook, management skill, brand recognition and competition. They are independent and have zero expected value. This is shown in the figure 4.1 below:

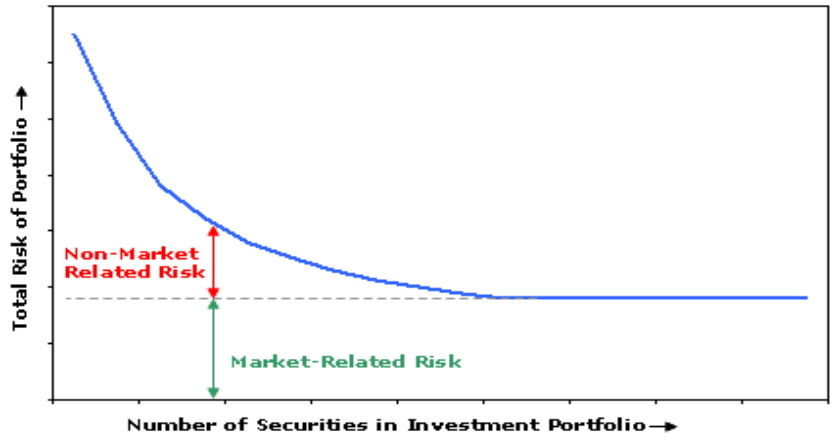

Figure 4.1 Diversification and Risk

As we can see, the unsystematic risk decreases by adding more stocks to a portfolio. Portfolio of 20 stocks will ensure diversifying away non-systematic risk and any next stock added to portfolio will not contribute significantly to decreasing systematic risk.

5 Theoretical Background

5.1 MPT and CAPM

Nobel Prize laureate Harry Markowitz laid down the foundation of Modern Portfolio Theory (MPT) in 1952. He explained how individual investors build their portfolios by choosing appropriate positions in risky assets and risk free assets depending on correlations between returns on risky assets and investors' attitude to risk. His work was followed by William Sharpe, John Lintner and Jan Mossin, who developed the Capital Asset Pricing Model (CAPM) in the 60s. This model brought Markowitz's ideas into general market model where prices are determined by demand and supply.

MPT shows that it is possible to build a portfolio that is less volatile than any single stock in the actual portfolio. This is possible as long as the assets are less than perfectly correlated. Markowitz mathematically explained how it is possible to increase expected return and decrease total volatility of a portfolio by adding a stock that is more volatile than the portfolio. Thus, MPT introduced the possibilities that diversification brings to the reduction of total risk in a portfolio.

The second contribution of MPT to modern finance is the explanation of how individual investors find optimal portfolios. Based on information about stock covariance, investors will identify efficient frontier of risky assets. This frontier consists of all the portfolios that offer the best risk-return combinations. Risk is measured as a portfolio's standard deviation. If all investors use the same input to calculate efficient frontier of risky assets and a risk-free asset is available, all investors will hold the same optimal risky portfolio. Investors will differ in how much of their assets they will invest in the optimal risky portfolio and how much they will invest in the risk-free asset. These differences are caused by different risk aversion degrees in investors. This is graphically illustrated in figure 5.1, where the investor can "chose" return on his or her investments by increasing or decreasing risk. Investors' optimal possibilities are represented by capital allocation line (CAL).

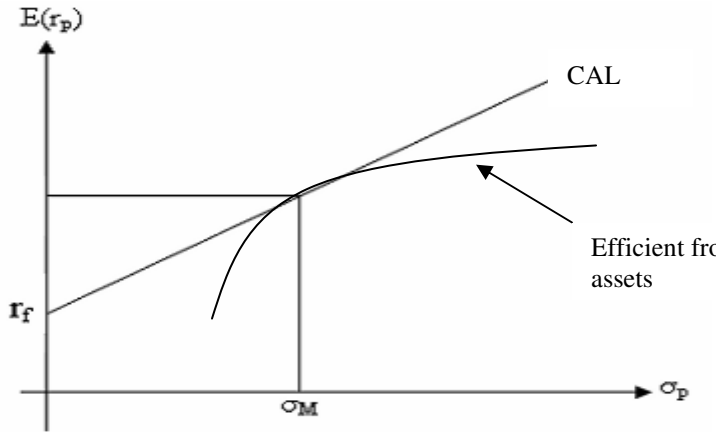

Figure 5.1 Capital allocation line

The CAPM is an equilibrium model for expected returns of assets, and relies on rather strict assumptions. The main assumptions are as follows:

- there are many investors who are all price takers;
- all investors plan to invest over the same time horizon;
- there are no transaction costs or taxes;
- investors can borrow and lend without limits at the same risk-free rate;
- the market portfolio consist of all tradable assets;
- all investors have homogenous beliefs about the distribution of returns.

These assumptions imply that investors are rational expected return-variance optimizers who use Markowitz portfolio selection model, and that all investors hold the same risky market portfolio. This portfolio coincides with the market portfolio when the market is in equilibrium. When asset market is in equilibrium – demand equals supply- the following relationship holds for all the assets in the market:

$$E(r_p) = r_f + \beta_p (E(r_m) - r_f)$$

where

- $E(r_p)$ expected return on asset p;
- r_f risk free rate;
- $E(r_m)$ expected market return;
- $E(r_m) - r_f$ expected market excess return over risk free return;
- β_p a measure of the relationship between asset's expected rate of return and the market expected excess rate of return.

β_p is defined as:

$$\beta_p = \frac{Cov(r_p, r_m)}{\sigma_m^2}$$

where σ_m^2 is variance of the market portfolio.

The CAPM measures the risk of an asset by determining the asset's contribution to the market portfolio risk. This contribution is measured by the asset's beta, and thus beta governs the expected rate of return on the asset. The expected return–beta relationship can be expressed graphically as the security market line (SML) in Figure 5.2.

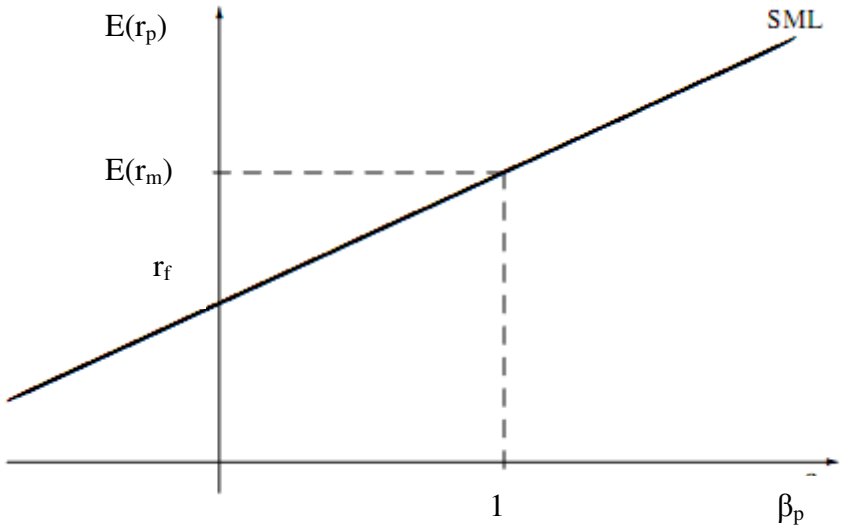

Figure 5.2 Security market line

When the asset market is in equilibrium, the SML shows the expected return on an asset given its risk measured by beta.

The CAPM has failed empirical testing, and there exist results testifying that also other factors, not just an asset's beta, determine rate of return on a given asset. Fama and French (1993) introduced a three-factor model, where size and book-to-value factors are included. This model has showed better prediction ability than the single factor CAPM.

5.2 The Single Factor Model

Single factor model is a purely statistical model used to explain the behavior of asset returns. The model takes form of a simple bivariate linear regression model, which implies

linear relationship between an unspecified factor and rate of return on an asset. This means that one factor will determine prices for all assets, though they may have different levels of sensitivity towards it. Model is written mathematically in the following way:

$$r_p = b_{p0} + b_{p1}F_1 + \varepsilon_p$$

where

- r_p is the rate of return on asset p;
- b_{po} and b_{p1} are parameters specific to asset p;
- F is the factor that determines asset price;
- ε_p is random unobserved error.

The model assumes that E(ε_p)=0 and ε_p is uncorrelated with the factor Cov (ε_p, F)=0.

The model lets the user determine the factor, like for instance the rate of growth of gross national product, changes in the rate of inflation, the unemployment rate, the rate of capital accumulation or the foreign exchange rate. The model does not seek to explain the behavior of the financial markets; it is rather a mean to generate testable hypothesis for exploring the evidence.

This model can easily be turned into multifactor model by adding to the equation other factors that have linear relationships with rate of return on asset.

$$r_p = b_{p0} + b_{p1}F_1 + b_{p2}F_2 + \ldots + b_{pk}F_k + \varepsilon_p$$

Sharpe substituted r_p with $(r_p - r_f)$ and F with $(r_m - r_f)$, where r_f is risk free rate of return and r_m is market rate of return, and arrived at the following type of single factor model.

$$(r_p - r_f) = b_{p0} + b_{p1}(r_m - r_f) + \varepsilon_p$$

This equation is known as Sharpe's single index model that is closely linked to the CAPM. It allows us to jump from the CAPM's expected rate of return, which is unobservable, to the already observed rates of returns on assets and markets.

5.3 Performance Measures of Mutual funds

The two major issues in any performance ranking are how to choose an appropriate benchmark for comparison and how to adjust a fund's return for risk. We will use a number of performance measures, they all measure fund's return relative to risk. However, they differ in how they define and measure risk and, consequently, in how they define risk adjusted performance (Simon, 1998).

Before we turn to more detailed analysis of performance measurements, we would like to give a short overview of the existing ratios. There exists 3 main types of ratios: 1) ones that will serve as guidance for undiversified investors namely Sharpe and M2 since they adjust the performance to total portfolio risk; 2) ones that are used by well diversified investors – Treynor measure and Jensen's alpha, these measurements adjust rate of return for systematic risk; 3) Appraisal ratio is useful for investors who already hold a portfolio approximated to market portfolio, meaning they are exposed to 0 unsystematic risk; this ratio adjust returns for un-systematic risk.

One can also divide the ratios by whether they measure absolute or relative performance. Sharpe and Treynor measure the absolute performance, since they don't measure performance relative to market/benchmark portfolio. M2, Adjusted Jensen's alpha and Appraisal ratio are relative performance measures, since they measure the portfolios excess return relative to that of market, and they give comparable values for different securities.

5.3.1 The Sharpe ratio

Sharpe ratio is also known as the reward- to-variability ratio. It was introduced by William Sharpe (1966), and it is a widely used risk-adjusted measure of performance. Sharpe's measure is calculated by dividing average portfolio excess returns over the sample period by the sample's standard deviation of returns σ_p:

$$S_p = \frac{r_p - r_f}{\sigma_p}$$

where

- r_p return on the portfolio;
- r_f risk free rate of return;

σ_p the standard deviation of the portfolio.

The ratio captures the excess return generated by the portfolio in comparison to the amount of risk taken defined as standard deviation of portfolio. The more risk taken, the higher the return should be to compensate for the risk. Sine the Sharpe ratio evaluates a portfolio based on total risk, this ratio is appropriate for not-well diversified investments. This is due to the fact that non-systematic risk contained in the portfolios standard deviation, cannot be diversified away. The Sharpe ratio is based on the MPT, and the Sharpe ratio for the market portfolio is the slope of the capital market line. The reward-to-variability ratio for any asset is the slope of the capital allocation line. In figure 5.3 we can observe that portfolio A has a steeper curve and a higher Sharpe Ratio than the market portfolio. It indicates that funds manager of this portfolio has outperformed market. Portfolio B has a lower Sharp ratio, and has under performed the market (Simons,1998).

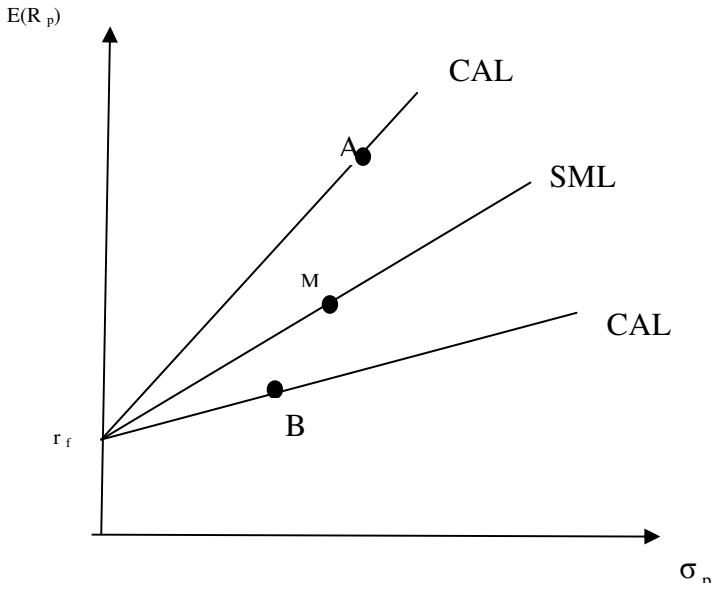

Figure 5.3 The Sharp Ratio and Risk-Adjusted Performance

5.3.2 The Treynor Ratio

This is a measure of portfolio excess return relative to its systematic risk, β_p. It is also known as Treynor index or Treynor reward-to-volatility, and was developed by Treynor (1965). This measure is appropriate tool for well diversified investors since they are just interested in systematic part of the risk represented by β_p. Treynor introduced the concept of the characteristic line whose slope measures the relationship between relative volatility of mutual funds returns β and the expected excess return (Haslem, 2003).

The Treynor ratio is calculated as follows:

$$T_p = \frac{r_p - r_f}{\beta_p}$$

where

- T_p portfolio p's Treynor ratio;
- r_p return on the portfolio;
- r_f risk free rate of return;
- β_p the estimate of portfolio p's beta.

As the market beta is 1, Treynor's index T_p for benchmark portfolio is $(r_m - r_f)$ where r_m is the market return. If T_p of the mutual fund portfolio is greater than $(r_m - r_f)$ then the portfolio has out performed the market. The Treynor ratio can be defined by the slope of SML and the slope of portfolio's characteristic line. The Treynor index of the market is the slope of the SML, and the Treynor measure of the portfolio is the slope of the characteristic line of the portfolio. As we can see in the figure 5.4, portfolio A **is** steeper than market (SML) and has a higher Treynor ratio. It indicates that A has done better than the market, while B has done worse.

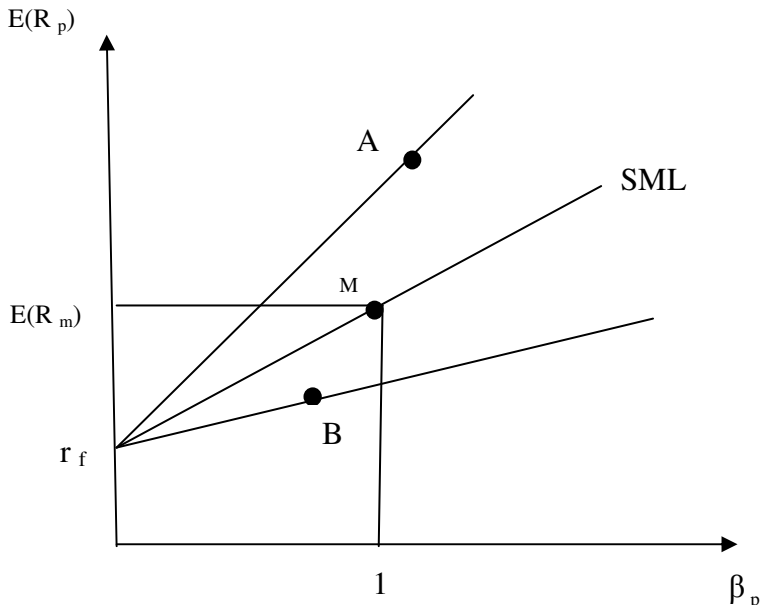

Figure 5.4 Treynor's measure

5.3.3 Jensen's Alpha

The Jensen (1968) Alpha or Jensen's differential return is the difference between a portfolios actual return and its expected return given the portfolio's systematic risk and that CAPM holds (Haslem, 2003). Jensen coefficient is not a relative value, but an absolute value. Significantly positive and negative alpha values are evidence of superior and inferior portfolio manager skills respectively. Higher manager skills represent the ability to select securities, low expense, and market timing. Alphas statistically not different from zero suggest performance equal to the market index on a risk-adjusted basis. A mutual fund's Jensen Alpha is correctly interpreted only relative to the market index's defined zero alpha. This is due to that fact that each asset's beta normally differs in size, and it makes performance comparisons among assets difficult.

The Jensen Alpha equation is computed as follows:

$$J_p = \alpha_p = r_p - \left[r_f + (r_m - r_f)\beta_p\right]$$

- J_p Jensen Alpha
- r_p return on the portfolio
- r_f risk free rate of return
- r_m the return to the market portfolio
- β_p the estimate of portfolio p's beta

As we can see in the Figure 5.5, the SML shows the value of α_A and α_B as the distance of portfolio A and B above and below the SML.

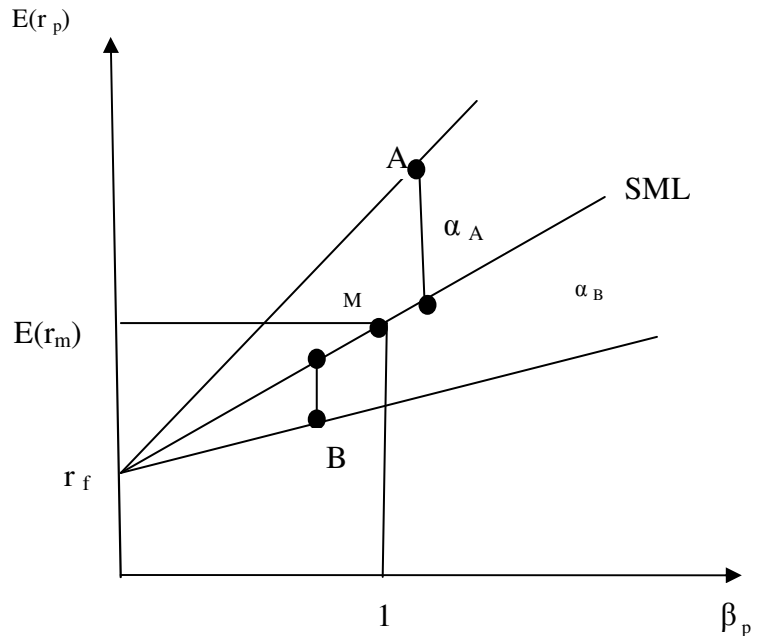

Figure5.5 Jensen measure

The regular Jensen Alpha may be correctly used to determine whether a particular mutual fund's portfolio manger has generated abnormal returns as represented by positive alpha. To make such a comparison among funds, however, each fund's Jensen Alpha must be divided by its beta to adjust its alpha for differences in systematic risk among the funds. With approximately same betas, the rank order of funds would be almost the same using Jensen Alpha and Adjusted Jensen Alpha (Halem, 2003).

The adjusted Jensen Alpha equation is computed as follows:

$$\text{Adj. } J_p = J_p / \beta_p$$

Relationship between Sharp and Jensen ratio is:

$$S_p = \frac{\alpha_p}{\sigma_p} + \rho_{pm} . S_m$$

Where ρ denotes the correlation coefficient between portfolio P and the market, and is less than 1. The Adjusted Jensen Alpha, Treynor and Sharpe ratios rank well diversified portfolios identically, but for less diversified portfolios, the Sharpe ratio may rank

portfolios differently than the other two ratios. This is because the Sharpe ratio measures total risk (standard deviation) while the others measures only systematic risk (beta).

Micheal C. Jensen studied 115 open end mutual funds in the period 1945-1964, and the result was that the funds on average were not able to predict security prices well enough to outperform a buy-the-market-and hold policy. There was also very little evidence that any individual fund was able to significantly better than that expected from mere random chance (Jensen, 1968). It is important to remember that he did not consider the question of diversification in his study. Thus his results do not indicate that mutual funds are not providing a socially desirable service to investors.

5.3.4 Modigliani and Modigliani (M^2)

The numerical value of Sharpe ratio is not easy to interpret as it gives absolute values, so a variant of Sharpe ratio was proposed by Graham and Harvey, and later by Modigliani. M^2 measure focuses on total volatility as a measure of risk, but its risk-adjusted measure of performance has the easy interpretation of a differential return relative to the benchmark index (Bodi, et al, 2005). Since their measure is expressed in percentage, they believed that the average investor could more easily understand it. To understand the M^2 measure, one can imagine that a managed portfolio is mixed with a risk free security like T-bills so the complete portfolio has the same volatility as the market index. This measure equals the return the fund would have received if it had the same risk the market index had.

M^2 measure is defined as follows:

$$M^2 = r_{p^*} - r_m = (S_p - S_m)\sigma_m$$

M^2_p Modigliani and Modigliani measure;

- r_{p^*} risk adjusted return of the mixed portfolio, it has the same standard deviation as market;
- r_f risk free rate of return;
- r_m the return to the market portfolio;
- S_p the Sharpe ratio of the portfolio;
- S_m the Sharpe ratio for the market portfolio;
- σ_m the standard deviation of the market .

As we can see from figure 5.6, the M^2 is the vertical distance between p* and M. One can move down the CAL corresponding to portfolio P until we reduce the standard deviation of the adjusted portfolio to match that of the market index. When the CAL is less steep than CML, P will have a negative M^2.

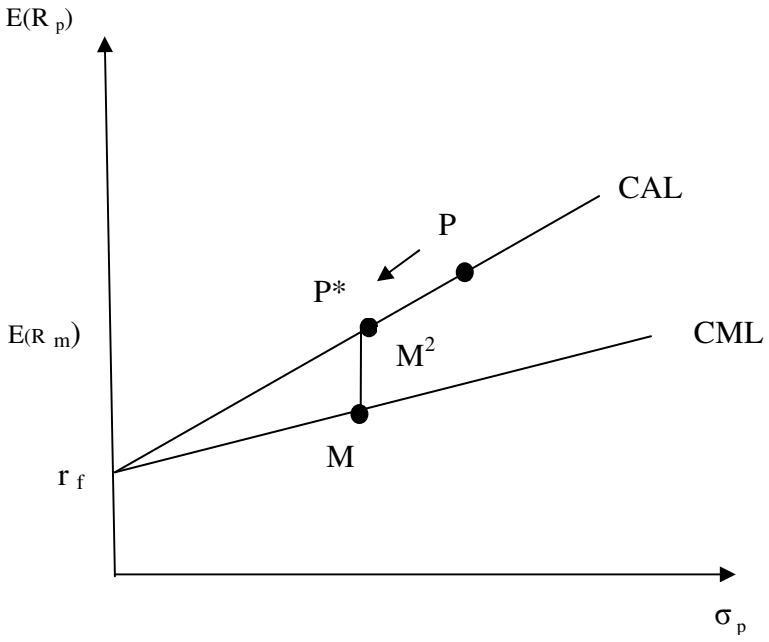

Figure 5.6 Modigliani and Modigliani

5.3.5 Appraisal Ratio

This ratio measures abnormal return per unit of risk that in principle could be diversified away by holding a market index portfolio. It measures the quality of a fund's investment picking ability.

This ratio is also known as the theoretical information ratio too, because it focuses on the risk and return generated from the fund manager's ability to use information to deviate from the index in order to beat the market index. Appraisal ratio is a relative value and indicates how skilled the funds mangers have been to find mispriced stocks and how well they make use of the available information.

Appraisal ratio is calculated by dividing the alpha of the portfolio to residual standard deviation in the industry.

$$AR_p = \frac{\alpha_p}{\sigma_{\varepsilon p}}$$

- AR_p Appraisal ratio for portfolio p;
- α_p alpha of the fund;
- $\sigma_{\varepsilon\rho}$ residual standard deviation= Non-systematic risk= Standard error.

The appraisal ratio is a convenient measure if this is an active portfolio which is mixed with a passive index portfolio; the extra return α compensates the voluntary non-systematic risk, σ_{ε}.

A good manager might have an IR of 0.5, while an exceptional manager might have an IR of 1.0. For any given level of residual risk, σ_{ε}, the objective is to maximize investor utility, U, defined as a portfolio excess return less the disutility of portfolio residual risk.

$U= \alpha-(\lambda \sigma^2_{\varepsilon})$

Increases in portfolio excess return raise investor utility, and increase in portfolio residual risk decreases investor utility by a facto, λ. λ is the investor's aversion to residual risk (regret aversion).

By substituting α from IR equation investor's utility can be written as a function of residual risk, investor risk aversion, and manager IR.

$U= (IR* \sigma_{\varepsilon}) - (\lambda \sigma^2_{\varepsilon})$

Investor utility will increase with an increase in IR and decline with increase in the investor's level of residual risk aversion. The optimal level of residual risk, σ^*_{ε} , for a portfolio will also increase with IR and decrease with aversion to residual risk(Jacobs, Bruce I. and Levy, Kenneth N. (2000).

5.4 Efficient Market Hypothesis

The concept of Efficient Market Hypothesis (EMH) allows us to explore in greater depth the performance of Norwegian mutual funds in our sampling period. All of the asset management companies in our sample assume that all assets in the market are not correctly priced, and that one can earn extra return by understanding and exploiting these inefficiencies.

The basic idea of the EMH is that stock prices already reflect all available information about the factors that will influence future prices. From this follows that stock prices are unpredictable, since we cannot predict "news" that will arrive and change the stock price. It is said that in efficient markets, stock prices follow a random walk with an upward tendency over time. Under EMH, the stock price of company X already reflects the

company's predicted cash flows, management style, information about the industry in which it operates, its market position, its previous earnings etc. The price will change as new information arrives. For example, an announcement of a new contract will make the price rise, while an unexpected loss or capital write down will make the stock price decline.

Efficient markets can prevail because there are people who gather the information that is relevant to the stock prices, and act on it by buying and selling stocks. Without them, markets would not be efficient. Market efficiency varies across markets and market segments. For example, developing country's stock market may not be as well researched as developed country's markets who have well-established culture of investments in stocks. In the same way, companies not listed on stock exchange may receive less scrutiny than listed companies. It is reasonable to assume that the price of these less analyzed assets may not reflect all available information.

It is common to distinguish between three versions of the EMH: weak, semi strong, and strong. These versions differ by what is included in the term "all available information." *The weak-form hypothesis* asserts that all the information derived by examining market trading data such as the history of past prices, trading volume, or short term interest is already incorporated in the price. Thus, it is useless to search for patterns in this information in order to predict future prices - it has already been done. *The semi strong-form hypothesis* understands "all available information" to be publicly available information regarding a firm. Namely, the stock price reflects information such as the firm's product line, management style, financial statements and strategy. *The strong-form hypothesis* states that stock prices reflect all information relevant to the firm, including information available only to company insiders. In most countries there are regulatory authorities that supervise that insiders do not misuse their privileged situation when it comes to firm relevant information by profiting selling stocks short or long.

It seems reasonable to assume that for the most markets the semi strong hypothesis will be valid, since the strong-form hypothesis implies that there are illegal actions taking place in the market.

Researchers have looked for performance persistence in the mutual fund industry. Existence of such persistence would imply that the weak form of EMH does not hold, and

that investors can predict portfolio performance by looking at past generated returns. At the same time, when trying to identify whether fund managers are able to time market and find underpriced stocks, the semi strong EMH form is tested.

5.4.1 Performance Persistence – Weak Form of EMH

Several major studies have tried to establish whether it is possible for investors to predict funds' performance based on past performance and a strategy can be constructed to allow investors to earn excess returns by analyzing historical data. Even if persistence of performance is identified, there seems to be no feasible strategy that would allow investors to earn extra returns. This is due to management fees and the fact that this phenomenon seems to vary over time

Most of the authors have come to the conclusion that performance persistence varies with the time period of the study. For example, Malkiel (1995) found that in the USA in the 1970s efficient market theory seemed to prevail in terms that it was not possible to predict future fund performance based on its past performance. However, this was not true in the 1980s and the late 1970s. Thus, it was possible for Malkiel to construct an investment strategy that earned excess returns in the 1980s, but this was not possible during the 1970s. He concluded that overall security markets are remarkably efficient, and investors will not gain excess return by investing in a fund that posses "hot hand". By "hot hand" we understand a fund that can deliver higher than average returns over a longer period of time.

Jegadeesh and Titman (1993) found that stocks exhibit a momentum property in which good or bad recent performance continues. They conclude that while the performance of individual stocks is highly unpredictable, portfolios of the best performing stocks in the recent past appear to outperform other stocks with enough reliability to offer profit opportunities.

5.4.2 Market Timing and Stock Picking Ability – Semistrong Form of EMH

Mutual fund managers are said to have market timing ability when they increase a fund's exposure to the market index prior to market advances, and decrease exposure prior to market declines. In other words, fund managers who are able to anticipate market and predict bull and bear markets. Most existing studies find little evidence that fund managers

possess market timing ability, and on average mutual funds tend to show negative measures of market timing according to Bollen and Busse (2001).

We must keep in mind that mutual fund manager's ability to shift a fund's allocation is constrained to varying degrees by the investment objectives of the fund. A manager constrained to holding equities might time the market by adjusting the correlation between a portfolio's return and the market return, as the market rises and falls. In addition, market timing activity is hindered by restrictions on the use of leverage and derivatives placed on mutual funds by the regulatory authorities.

It is common practice to divide portfolio performance into two main components, security selection and market timing. Several techniques are available to estimate the different components of portfolio performance. When direct observations of the managers' market forecasts or portfolio composition is impossible, it one can relay on methods that require only the portfolio's historic returns to evaluate managers' market timing ability, namely 1)Treynor and Mazuy (TM) and 2) Henriksson and Merton (HM).

Treynor and Mazuy (1966) developed the following regression to test for market timing ability.

$$\left(r_p - r_f\right) = \alpha_p + \beta_p\left(r_m - r_f\right) + \gamma_p\left(r_m - r_f\right)^2 + \varepsilon_p$$

where

- $\left(r_p - r_f\right)$ is the excess return on a portfolio;
- $\left(r_m - r_f\right)$ is the excess return on the market;
- γ_p measures market timing ability;
- ε_p is the regression model error term.

If mutual funds increase (decrease) the portfolio's exposure to the market prior to a market upturn (downturn), the portfolio's return will be a convex function of the market's return. This involves a positive γ_p.

Henriksson and Merton (1981) developed a different test of market timing, which is more appropriate when estimating market-timing possibilities of managers who are restricted in their actions and can choose to allocate assets between equity and cash.

$$\left(r_p - r_f\right) = \alpha_p + \beta_p\left(r_m - r_f\right) + \gamma_p r_m^* + \varepsilon_p$$

where

- $r_m^* = \max\left[0, \left(r_m - r_f\right)\right]$

Both methods are extensions of the CAPM, and assume that in each observation period the manager attempts to forecast whether the market will have positive or negative excess return. Both models also assume that managers act on their predictions either by choosing higher or lower level of systematic risk - beta - or shift from equities to cash or cash to equities.

Both models assume there are two sources of performance, market timing and stock picking. By stock picking we understand the skill to find under priced stocks that will rise in value faster than the market. Since gamma in both models represents market timing ability, we are left with alpha as a measure for stock picking ability. The models assume that all managers have the same reaction function to the market forecasts; this can be a source of misleading results. If managers' reaction to a predicted market downturn is switching from equities to cash, this activity will be best captured and measured by HM test, while it might not show up in TM test. Vice versa applies to fund managers who, faced with forecast of bear market, will switch to equities with negative correlation with market. Thus, it seems meaningful to discover managers' reaction to predictions of market movements, and then chose the most appropriate test to check if the manager possesses market timing ability or not.

Goetzmann et al. (2000) elaborated another widely used test for market timing, which is somewhat similar to the models already described. By estimating market timing coefficient instead of market excess return as an independent variable, Goetzmann uses monthly factor as proxies for the monthly payoffs of a successful market timer.

Bollen and Busse (2001) show in their research that using daily returns when evaluating fund performance will give more precise estimates and sharper inference. They also suggest that mutual fund managers may possess more timing ability than previously documented., based on their analysis of fund performance using daily returns.

Most studies evaluating timing ability normally account for anomalies of Sharpe's (1964) single-factor CAPM, like for instance Fama and French (1993) size and book-to-market factors and Carhart's (1997) momentum factor. This can be done either by running multiple factor model, or by using stochastic discount factors like Chen and Knez (1996). This is necessary in order to avoid rewarding managers for simply exploiting these anomalies.

Many studies point to a negative correlation between the market timing and selectivity measures of performance, like for instance Jagannathan and Korajczyk (1986), Coggin (1993) and Goetzmann (2000). Jagannathan and Korajczyk (1986) suggest the following explanation for the negative correlation between alpha and gamma values: "If the funds being analyzed tend to hold assets that are less option-like than the average asset in the market proxy, then one would expect to see negative timing and positive selectivity measures. On the other hand, funds holding assets that are more option-like than the assets in the market proxy should show positive measures of market timing and negative measures of security selectivity." They also put together a portfolio that by construction did not posses market timing ability, but that showed market timing ability using HM and TM tests, thus exposing the shortcomings of these tests.

6 Methodology

6.1 Linear Regression Model

Linear regression model allows us to evaluate relationship between a dependent variable and an independent variable(s). Linear regression equation can be expressed in the following way:

$$Y_t = \beta_0 + \sum_{j=1}^{k} \beta_j X_{tj} + \varepsilon_t$$

where

- Y_t dependent variable ;
- X_t independent variable(s) $X_t = (Xt_1, \ldots X_{tk})$;
- β_t estimated parameter(s) $\beta_t = (\beta_{t1} \ldots \beta_{tk})$;
- ϵ_t is residual or the observed error term.

The model by calculations identifies linear relationship between the dependant variable and the independent variable(s). This relationship is described by β_t and it is calculated by employing Ordinary Least Square method, where one estimates a regression line by minimizing the distance between the observed data and estimated line. This model gives us estimated parameters that ensure the least variance possible for observed error terms. R^2 is a measurement also called coefficient of determination and illustrates by how much the independent variable(s) explain movements in dependent variable.

There are several underlying assumptions that must be fulfilled in order to ensure that OLS is the best linear unbiased estimator (BLUE):

- $cov(\epsilon_t, \epsilon_p) = 0$ error terms are stochastically independent of each other and they are uncorrelated;
- $var(\epsilon_t) = \sigma^2$ variance of error terms is constant – heteroseskedasticity;
- $cov(\epsilon_t, x_t) = 0$ none of the observations x contains information about ϵ ;
- $\epsilon_t \sim N(0, \sigma^2)$ error term is normaly distributed with $E(\epsilon_t) = 0$ and $var(\epsilon_t) = \sigma^2$.

6.2 Assessment and the Validity of the Model

Coefficient of determination -R^2 **-** is one of the measures we can use to evaluate how accurate is a regression model. R^2 also measures what fraction of a fund's volatility is attributable to market movements and is calculated as follows:

$$R^2 = \frac{\beta^2 \sigma_M^2}{\sigma^2}$$

where

- $\beta^2\sigma^2_M$ the systematic variance
- σ^2 the sample's total variance defined as $\beta^2\sigma^2_M + \sigma^2(e)$ where $\sigma^2(e)$ is the unsystematic component.

R^2 may also be expressed as follows:

$$R^2 = 1 - \frac{\sigma^2(e)}{\sigma^2}$$

1- R^2 is then the variance not explained by market movements. The coefficient of determination can be interpreted as a measurement of fund's degree of diversification. A high R^2 indicates that the mutual fund is well diversified and the non-systematic risk is low.

Funds that have a different investments strategy than following benchmark index will have a low R^2, and then deviation from the estimated regression line will be larger. It means the higher the value of R^2, the lower the deviation from the estimated regression line.

T-value is used to measure how valid the different estimated regression coefficients are. This is expressed mathematically as follows:

T = (estimate-hypothesized value)/ Standard error of the estimate

We assume H_0= α is equal to zero/ β is equal to one while H_1= α is different from zero/ β is different from one. We use critical t-values to reject or accept the null hypothesis. If the t-value is higher than the critical value, we can reject the null hypothesis.

6.3 Error Variable Diagnosing

6.3.1 Autocorrelation

Autocorrelation means that residuals are dependent on each other and correlated. This is not consistent with the requirement of independence of error variables. The Durbin Watson statistic is used to test for the presence of the first order correlation in the residuals of a regression equation. The test compares the residuals from time period t with residuals from time period t-1, and develops a statistics that measures the significance of the correlation between these successive comparisons.

The formula for the statistic is as follows:

$$DW = 2.(1 - corr(\hat{\varepsilon}_t, \hat{\varepsilon}_{t-1})) = 2.(1 - \frac{\sum \hat{\varepsilon}_t . \hat{\varepsilon}_{t-1}}{\sum \hat{\varepsilon}_t^2}) = \frac{\sum_{t=2}^{n} (\hat{\varepsilon}_t - \hat{\varepsilon}_{t-1})^2}{\sum_{t=1}^{n} \hat{\varepsilon}_t^2}$$

where

- DW Durbin-Watson statistics
- $\hat{\varepsilon}_t$ Regression's residual
- t time period counter

The statistics is used to test for both positive and negative correlation in the residuals. The statistics has a range from 0 to 4, and it depends on the number of observations and significance level to test whether first-order autocorrelation exists. The null hypothesis says that there is no significant correlation. By using a table of critical values of DW, one can find values of DW_L and DW_U. The DW co-efficient determines whether the null hypothesis will be accepted or rejected. This is demonstrated in the table below:

Interval	**Conclusion**
0 ⟶ DW_L	Reject H_0: Positive autocorrelation
DW_L ⟶ DW_U	Neither accept or reject
DW_U ⟶ 4- DW_U	Accept H_0: No autocorrelation
4- DW_U ⟶ 4-DW_L	Neither accept or reject
4-DW_L ⟶ 4	Reject H_0: Negative autocorrelation

Otherwise a very simple method is used to test whether the requirement of independence of error variables is satisfied. If a DW test statistic lies between 1.5 and 2.5, then the requirement of independence will be maintained (Kaplan and Atkinson, 1989).

If there is evidence of auto correlation in residuals, the coefficient estimates are still unbiased, but they are inefficient, i.e. they are not blue, even at large sample sizes. Consequently, the standard error estimates could be wrong. In the case of positive serial correlation in the residuals, the OLS standard error estimates will be biased downwards relative to the true standard errors. That is, the OLS will understate their true variability. This would lead to an increase in the probability of type I error- that is, a tendency to reject the null hypothesis sometimes when it is correct. Furthermore, R^2 is likely to be inflated relative to its 'correct value' if positive autocorrelation is present but ignored, since residual autocorrelation will lead to an underestimate of the true error variance (Brook, 2002).

6.3.2 Heteroskedasticity

Heteroskedasticity means that the variance of the unobservable error, σ_ε^2, is not constant, and error variables are related (in expected value) to one or more of the explanatory variables. If the errors are Heteroskedasticity, OLS estimates will still give unbiased and therefore also consistent coefficient estimates, but they are no longer BLUE. Thus, inferences from the standard errors are likely to be misleading. If there is positive auto correlation (which is often the case in practice), the OLS slope standard errors will be underestimated and too low. Consequently, the estimated alpha and betas can be significant even when they actually are not supposed to (Brooks, 2002). This is demonstrated by the formula we used to find the t-statistic in section 6.2.

$$T = \frac{\hat{\alpha} - \alpha}{s(\hat{\alpha})}$$

There are many tests for heteroskedasticity, and we have used Breusch-Pagen test (Wooldrige, 2003).

In this test, we assume that the ideal assumption of homoskedasticity holds, and we require the data to tell us otherwise. Because we are assuming that u has a zero conditional expectation, $Var(\varepsilon_t | x) = E(\varepsilon_t^2 | x)$, so the null hypothesis and alternative hypothesis of homoskedasticity are as following:

$H_0 = Var(\varepsilon_t^2 | X_1, X_{2,\ldots}, X_k) = \sigma^2$

$H_1 = Var(\varepsilon_t^2 | X_1, X_{2,\ldots}, X_k) \neq \sigma^2$

Dependent variable is the square of the error in the original regression equation, One observe the relationship between square of the errors and (X_1,$X_{2,\ldots,}X_k$). In our model, we have just one independent variable namely the markets excess return $(r_m - r_f)$. A simple approach is to assume a linear function:

$$\varepsilon_t^{\,2} = \delta_0 + \delta_1 x_1 + \delta_2 x_2 + \ldots + \delta_k x_k + \nu$$

Then the null hypothesis is $H_0=\delta_1= \delta_2= ...= \delta_k=0$. Since we never know the actual error, we use the estimated error from the regression between square of the errors and (X_1,$X_{2,\ldots,}X_k$). Then we can test the heteroskedasticity by using the F statistic which has an $F_{k,n-k-1}$ distribution under the null hypothesis of homoskedasticity. This is expressed as follows:

$$F=\frac{R^2(\hat{\varepsilon}_t^{\,2})/k}{(1-R^2(\hat{\varepsilon}_t^{\,2}))/(n-k-1)}$$

where

- K the number of regressors(independent variables)
- n the number of observations

We can use either the p-values or critical values of F to decide whether heteroskedasticity exists in our sample or not.

6.3.3 Normality

Normality assumption for error variables is not critical for finding correct estimated parameters by OLS estimation. In a large sample like ours, a usual t-test will still be valid, and the consequences for different estimated parameters will also be small.

6.4 Performance Persistence

We look at the persistence of performance for the Norwegian equity funds at one year-frequency in the period 1998-2008. We chose one year-frequency for the following reasons: “First, papers that find evidence of persistence generally do so for one-year horizons. Second, investors and fund managers tend to evaluate performance over annual periods. Third, tests of performance persistence require return availability for both ranking and evaluation periods. This leads to a look-ahead bias which can influence how much persistence is detected, ” Keswani, Stolin (2005). To measure performance persistence we

employ two methods: 1) persistence of rate of return and 2) persistence of portfolio's alpha. The first method allows us to check for relative performance persistence among funds relative to each other. The second method allows us to look at portfolio performance persistence in absolute values when the fund performance is measured against a benchmark.

6.4.1 Persistence of Rate of Return

The methodology was developed by Goetzmann and Ibbotson (1994). It was later applied by Brown and Goetzmann (1995) and Malkiel (1995). The funds are ranked by one-year total returns. We use total returns that are not risk adjusted. 50 % of the funds, showing the highest returns, are labeled "Winners" (W), and the resting 50 % of the funds with the lowest returns are labeled "Losers"(L). We calculate the median for each year in order to divide the Norwegian equity funds in our sample in "Winners" and "Losers".

Next, we look at the percentage of how many "Winners" from the period *t-1* are classified as "Winners" in period *t*, and how many "Losers" are classified as "Winners". Thus, we can identify WW, WL, LW and LL pairs for all the years. We use a z-test to see whether the number of funds with persistent performance (that is, the number of Winner-Winner and Loser-Loser pairs) is significantly greater than what would be predicted by pure chance.

We let p be the probability that a winning fund continues to be a winning fund in the following period, and assume independence across funds. If there is no performance persistence, we would expect p to be equal 0.5. Meaning that half of the Winners from period *t-1* would stay Winners in period *t*, and the other half would become Losers. We can provide evidence against persistence in winning funds by failing to reject the null hypothesis that p = 0.5. Since the number of persistently winning funds is a random variable it will have a binomial distribution b(n, p). We denote the number of persistently winning funds with *Y*. Now we can construct a binomial test to see if the probability p of consistent winning is greater than 0,5.

When n is reasonably large (different sources define reasonably large n as >20 up to >40, we are operating with n=18) and the probability is close to 0.5, one can use z test, to test 0 hypothesis. Z value is calculated as follows:

$$z = \frac{(Y - np)}{np(1-p)}$$

where

- z is a random variable N(0,1)
- n is the number of observation
- p is probability for Winner in *t-1* period to stay Winner in *t* period.

The number of observation equals 18 since we are just observing 50% of the funds that were winners in period *t-1*. We establish critical two tailed z value at |z|=1,96 at 5% significance level. For any smaller observed z values we cannot reject null hypothesis.

6.4.2 Persistence of Portfolio's Alpha

To evaluate the persistence of portfolios alpha over two consecutive periods, we have employed the method used by Brown and Goetzmann (1995).

In contrast to the relative performance evaluation when Winners were any fund doing better than the 50% of the sample in this case we define Winners as funds who have produced positive alphas. We calculate Jensen's alphas for each year in the same way we have done to rank and compare funds. We assume that the CAPM holds.

For each period we identify Winner-Winner(WW), Winner-Loser(WL), Loser-Loser(LL) and Loser-Winner(LW) funds. For example, LW denotes a fund that in the year *t-1* was labeled as a Loser (negative alpha), but in period *t* as a Winner with positive alpha. After having identified WW, WL, LL, LW pairs for each year, we calculate cross-product ratio (CPR) in the following way:

$$\mathrm{CPR} = \frac{(\mathrm{WW} * \mathrm{LL})}{(\mathrm{WL} * \mathrm{LW})}$$

This coefficient captures the fraction of funds that manifests persistence. We can derive null hypothesis of no-persistence when CPR =1 and performance in the first period is unrelated to the performance in the second period. CPR >1 indicates that there exist performance persistence while CRP <1 shows a reversal trend – if a fund achieved positive alpha in year *t-1*, it will more likely generate negative alpha in year *t*. We test null hypothesis that CPR=1 by using z-test where z value is calculated in the following way:

$$Z = \frac{\ln(CPR)}{\sigma_{\ln(CPR)}}$$

Where z is N(0,1) and standard deviation of *ln(CPR)* is defined as follows:

$$\sigma_{\ln(CPR)} = \sqrt{\frac{1}{WW} + \frac{1}{LL} + \frac{1}{WL} + \frac{1}{LW}}$$

With significance level at 5 % we establish critical two tailed z value at |z|=1,96 in order to reject null hypothesis of CRP=1.

7 Data

7.1 Observation Period and Fund Types

For our study we have chosen to look at the performance of Norwegian equity funds in period from April 1998 – March 2008 that are domiciled in Norway. This leaves out a couple of Norwegian equity funds registered in Luxembourg.

We chose our observation period so that it would coincide with an investment time horizon. The rule of thumb and investment management companies suggest to their clients when investing in equity fund to consider a time horizon of at least 5 years due to volatile stock prices. But when looking at Norwegian stock market we observe long down trends as from 2000 – 2003 and up trends the years after 2003 until 2007. Thus 5 years investment horizon for an investor will be too short, as it will capture mostly just the down or the upside of the stock markets.

Funds are grouped according to their investment universes, meaning that all the funds in one group have more or less the same investment mandate. This allows for more reliable comparison among funds. For example it is meaningless to compare a fund investing in Norway with a fund investing in Baltic countries since we can reasonably expect that Norwegian stock market is more efficient than Baltic market thus earning positive alpha in Norway can not be compared to positive alpha in Baltic countries.

7.2 Monthly Returns on Norwegian Equity Mutual Funds

The rate of return calculation is based on end-of-period observations. It is measured using the closing net asset value (NAV fund share price excluding management, redemption fee or sales charge) of the fund on the last trading day of the month and the closing NAV on the last trading day of the previous month. Afterwards rate of return is adjusted for dividend distribution with underlying assumption that all dividends are reinvested. Rate of return is adjusted for corporate actions, like stock splits etc. and is calculated as follows:

$$r_{t_0,t} = \left(\frac{P_t}{P_{t_0}} * \prod_{d=1}^{n} \left(1 + \frac{D_d}{P_{d-1} - D_d} \right) \right) - 1$$

where

- $r_{t_0,t}$ total return for period t_0-t;
- P_t adjusted price at time t;
- D_d adjusted dividend at ex-date d. All dividends with ex-dates within the time frame(t_0, t) are included;
- P_{d-1} adjusted price last inclusive dividend date.

However the data do not reflect the real return gained by investors since it is not adjusted for purchase, selling and management fees nor taxes. It is not critical for our study to adjust rate of return for any of these factors. In our case it would be a complex task to adjust the returns for fees since they vary along with the amount of invested capital and when it comes to taxes, the laws have changed during our observation period.

7.3 Market Portfolio Benchmark

Grinblatt and Titman (1994) show that tests of performance are quite sensitive to the choice of benchmark. The role of a benchmark is important as it determines adjustment of rate of return for risk. Since we are using CAPM model for our estimates this benchmark is going to serve as the only proxy for estimating systematic risk vs fund specific risk. In empirical finance market indices serve as proxies for benchmarks.
The index family can be divided into two groups:

- *All-Share Index and the Sector Indices* aim to reflect the overall state and changes in the level of the economy. There are no requirements for liquidity and stability thus it makes difficult to replicate these indices.
- *Benchmark Indices* - this group is focused on investability of the constituent companies and periodic stability of the index composition, while still reflecting the population of stocks in order for the index to function as an investible benchmark for the investment community.

In Norwegian market we find five indices of interest calculated by Oslo Børs. All of them are gross indices, meaning that all dividends are reinvested.

1. OSEAX All Shares Index includes all the shares traded in Oslo Børs. Index is adjusted for both corporate actions (share splits, mergers, demergers, new issues, stock redemptions and cancellations etc.) and dividends. Until February 2001 this index with slightly different security weights was known as TOTX Total Index.

2. OSEBX Benchmark Index includes shares that serve as representation of all the traded shares in Oslo Børs. OSEBX is revised semi-annually and the composition does not change for the period to secure stability with exception for corporate action adjustments. The index is adjusted for restrictions in free float and liquidity is a factor when including shares in index.
3. OBX Index is a stock market index which lists the 25 most traded companies on the OSEBX index.
4. OSEX Small Cap Index consists of the 10% lowest capitalised shares on Oslo Børs.
5. OSEFX Oslo Børs Mutual Fund Index it is weight adjusted OSEBX in order to comply with the UCITS directive. The capping criteria:
    - The market value of securities issued by the same body may not exceed 10 per cent of the index total market value.
    - The market value of securities issued by the same body exceeding 5 per cent index weight must not combined exceed 40 per cent of the index' total market value.
    - The index is adjusted for any capital redistribution.

One of the drawbacks of benchmark indices is that they tend to portray survivorship bias since they include big and most liquid shares and companies that fall out of the favour with investors will drop out of the benchmark index portfolio, on the other hand benchmark indices may leave out small growth companies.

Our choice falls on OSEFX index when performing most tests for two reasons (1) most of the funds we study give OSEFX as their reference index; (2) the large majority of the funds we study are UCITS funds that implies regulatory restrictions on the composition of portfolio, these restrictions are taken in consideration when constructing OSEFX. However, for some tests we use different ratios and it is specially indicated.

We feel comfortable with this choice since our aim is not to answer the question whether the funds can beat the market, but to compare funds against each other, so it is logical to pick a benchmark that takes in consideration real world restrictions and that aims to be an investible portfolio with respect to liquidity and stability.

Choice of benchmark affects the rate of total return, but has little or no effect of rankings when different benchmarks are employed as concludes Lehmand and Modest (1987).

7.4 Risk Free Rate of Return

In practice there is no risk free rate of return since all investments involve some default risk. However in empirical studies the rate of return on bonds issued by state with maturity of 3 month is used as a proxy for risk free rate of return.

Norwegian Central Bank issues short-term obligations and one of the reason it does so is to secure an efficient financial market by providing reference for risk free rate of return. In our case for Norwegian market we will use Oslo Børs calculated STX1 (3 month Treasury bills) index that has been calculated since 1995. The market for Norwegian government short term bonds can be regarded as illiquid, but Oslo Børs employ statistical techniques to compensate for this lack of liquidity. The tree month rate of return is used since it balances the impact of short term rate fluctuations in turbulent markets and expected inflation rate impact on longer term interest rates.

However there is another possible option for risk free rate of return, namely NIBOR (Norwegian InterBank Offered Rate). This rate indicates the cost of money for banks or the rate at which they lend to each other for different time periods. This rate is frequently used in empirical finance in smaller countries since it is more liquid than 3month government bonds.

7.5 Survivorship Bias

Data set we have employed in our study contains the past records of all the funds registered at Oslo Børs *currently* in existence. This creates the possibility of significant biases in the return figures calculated. High returns will tend to persist, since funds whose are unsuccessful will tend to drop out of the sample. It is extremely difficult to sell a mutual fund to the public that has a poor record. Companies that have several funds under management tend to merge the unsuccessful fund into more successful one thus burying the bad record.

Malkiel in his 1995 study points out another common practice among asset management companies so called “incubator” funds strategy when company sets up 10 relatively small funds with different managers and waits until some of them have shown excess return over a short period of time 3 to 5 years. Then these successful funds are heavily marketed to public and rest of the initial funds is closed down together with their bad performance. In

this way only the well performing funds are to be found in publications of mutual fun returns.

Malkiel showed that in period 1982-1991 there is a 1,5 % difference in the average yearly returns between general equity funds that have survived the whole period and all the funds that have existed each year. This is quite a substantial number and shows that one must take in consideration the survivorship bias. Malkiel (1995): "We conclude that analyses that systematically excluded nonsurviving funds will significantly overstate the returns received by mutual fund investors."

We don't have information on situation in Norwegian funds market, but numerous fund mergers and the variation in fund numbers from year to year suggest that survivorship bias could be a problem for our data set.

7.6 Presentation of Funds

All information about the funds and management companies was collected from Oslo Stock Exchange, the websites of the companies and the statistics provided by Norwegian Mutual Fund Association. Table 7.1 shows a detailed overview of the selected 36 funds. The table includes management fee, subscription fee, redemption fee, risk profile, benchmark index, fund's management company and its size in terms of capital under management.

As we can see, DNB NOR Kapitalforvaltning and Storebrand Kapitalforvaltning are represented by seven and six funds each. Other investments companies are represented by 1-5 of their funds.
Funds in our sample use OSEFX, OSEBX, OBX and OSESX as their reference indices. 23 of 36 funds use OSEFX, while OSEBX is used by 9 funds. The rest have OBX and OSESX as their reference indices.

Subscription fee varies from 0.3-3%, while management fee varies between 0,7-2%. Redemption costs are between 0.1-1.5 %. Fourteen mutual funds have the maximum management fee of 2% and only Alfred Berg Norge + and PLUSS index have the lowest management fee of 0,7%. Alfred Berg Norge + has also the lowest subscription fee of 0.3%. Index funds offer the lowest management fees since they do not incur costs of active

management. On the basis of redemption costs, Post Banken Norge is the cheapest fund while Delphi Norge and Kaupthing Norge are the most expensive funds.

Different fund management companies develop different risk scales to describe the risk, but one of the most used scales rank the risk from 1 to 10. The risk scale is described as below:

1 to 3: Low risk

4 to 5: Fair risk

6 to 7: Moderate/High risk

8 to 10: High risk

As represented in the table, most Norwegian equity funds have a high risk profile, while just four funds claiming low risk.

Fund name	Reference index	Subscription fee	Redemption cost	Management fee	Risk profile
ABN AMRO Kapitalforvaltning:	**NOK 23,5**	**billion**			
ABN AMRO Aktiv	OSEFX	3,0 %	0,5 %	1,5 %	High
ABN AMRO Kapital	OSEFX	3,0 %	0,3 %	2,0 %	High
ABN AMRO Norge	OSEFX	3,0 %	0,5 %	1,2 %	Low
ABN AMRO Norge +	OSEFX	0,3 %	0,3 %	0,7 %	Moderate/high
GAMBAK	OSEFX	3,0 %	0,3 %	1,8 %	High
DNB NOR Kapitalforvaltning:	**NOK 104,5**				
Postbanken Norge	OSEBX	1,0 %	0,1 %	1,8 %	High
DnB NOR Norge (I)	OSEBX	3,0 %	0,2 %	2,0 %	High
DnB NOR Norge (III)	OSEBX	0,7 %	0,2 %	1,0 %	High
DnB NOR Norge Selektiv (I)	OSEBX	3,0 %	0,2 %	2,0 %	High
DnB NOR Norge Selektiv (III)	OSEBX	0,7 %	0,2 %	0,8 %	High
Avanse Norge (I)	OSEFX	3,0 %	0,2 %	1,8 %	High
Avanse Norge (II)	OSEFX	1,2 %	0,2 %	1,2 %	High
Nordea fondene:	**NOK 27**	**(1230)[1]**			
Nordea avkastning	OSEFX	2,9 %	0,2 %	2,0 %	Moderate/high
Nordea Kapital	OSEFX	1,0 %	0,2 %	1,0 %	Moderate/High
Nordea Norge Verdi	OSEFX	2,9 %	0,2 %	1,5 %	Moderate/high
Nordea SMB	OSESX	2,9 %	0,2 %	2,0 %	High
Nordea Vekst	OSEFX	2,9 %	0,2 %	2,0 %	high
Storebrand Kapitalforvaltning:	**NOK 41**				
Storebrand Aksje Innland	OSEBX	0,3 %	0,3 %	0,6 %	Moderate/high
Storebrand Norge	OSEFX	3,0 %	0,5 %	1,5 %	Moderate/ high
Storebrand Vekst	OSEBX	3,0 %	0,5 %	2,0 %	High
Storebrand Verdi	OSEBX	3,0 %	0,5 %	2,0 %	Moderate/ high
Delphi Norge	OSEFX	2,0 %	1,5 %	2,0 %	High
Delphi Vekst	OSEFX	3,0 %	0,5 %	1%-4%	High

Carnegi Kapitalforvaltning:	**NOK 9,5**				
Carnegie Aksje Norge	OSEFX	3,0 %	1,0 %	2,0 %	Low
Carnegie Norge Indeks	OBX	3,0 %	1,0 %	0,8 %	Low
Danske Kapital AS:	**NOK 6**				
Danske Fund Norge I	OSEFX	2,0 %	0,3 %	2,0 %	High
Danske Fund Norge II	OSEFX	1,5 %	0,3 %	1,5 %	High
Danske Fund Norge Vekst	OSESX	2,0 %	0,3 %	1,7 %	High
Handelsbanken fondforvaltning:	**NOK 3**				
Handelsbanken Norge	OSEFX	3,0 %	0,5 %	2,0 %	Moderate
Kaupthing forvaltning As:	NOK 0,07				
Kaupthing Norge	OSEFX	2,0 %	1,5 %	2,0 %	Moderate
Warren Wicklund fondsforvaltning:	**NOK 2**				
NB-Aksjefond	OSEBX	3,0 %	1,0 %	2,0 %	High
ODIN forvaltning:	**NOK 38**				
ODIN Norge	OSEFX	3,0 %	0,5 %	2,0 %	High
Orkla Finans Fondsforvaltning:	**NOK 2**				
Orkla Finans Investment Fund	OSEFX	2,5 %	0,5 %	1,8 %	High
Fondsforvaltning AS:	**NOK 2**				
PLUSS Aksje	OSEFX	0,5 %	0,5 %	1,2 %	High
PLUSS Index	OBX	0,5 %	0,5 %	0,7 %	High
PLUSS Markedsverdi	OSEFX	0,5 %	0,5 %	0,9 %	High

Table 7-1 Fund Presentation

In our sample, there are funds from 12 different asset management companies. Two of them are stand-alone asset management companies**: WarrenWicklund Fondsforvaltning AS** and **Fondsforvaltning AS**. These companies manage respectively 13 and 12 different types of mutual funds.

The rest of the companies belong to bigger financial groups with the exception of **Orkla Finans**. Orkla Finans Forvaltning is a subsidiary of Orkla group, and started its business by managing Orkla group and other industrial companies assets. Now it has expanded its business to private customers as well, and concentrates on alternative investments such as private equity, real estate and hedge funds.

The rest of the companies are subsidiaries of whether Norwegian or foreign larger financial groups composed of banking, asst management and/or insurance units. The sector during the last decade is characterized by consolidation and dynamism.

DnB NOR Kapitalforvaltning AS is the biggest asset management company in Norway, and a subsidiary of DnB NOR group. It has around 100 fund managers and analysts placed in Norway, US, Sweden, UK and China. The company manages 13 Norwegian mutual funds and is the market leader in this niche.

Storebrand Kapitalforvaltning AS is a subsidiary of Storebrand group. Storebrand group in 2007 bought Swedish company SPP whose fund management division now is integrated in Storebrand Kapitalforvaltning AS. The group acquired Delphi Fondsforvaltning in 2002. It is worth noticing that Delphi in 1995 acquired Norse Forvaltning together with the fund, which is known today as Delphi Norge.

Alfred Berg Kapitalforvaltning AS is a subsidiary of Fortis Investments and part of Fortis group, who acquired the company from ABN AMRO Asset Management – the previous owner- in 2007. Fortis Investments is one of the leading global asset managers in the world with 218 bn of Euros under management. Alfred Berg Kapitalforvaltning AS has developed through many mergers and acquisitions in the last decade.

ODIN Forvaltning AS from 2000 became a 100% subsidiary of SpareBank 1 Gruppen AS and manages 11 equity funds.

Nordea Fondene Norge AS stands out from the other companies by the fact that it has outsourced actual management of funds to Nordea Investment Management AB. Nordea Investment Management AB that is located in Luxembourg, and manages 157 billion EUR worth of assets. Nordea Group strategy is based on fund management consolidation to one platform in Luxembourg. The subsidiaries in different countries function more as distributors than actual fund managers.

These five above described management companies, which belong to financial groups, have more than 20 bn NOK of assets under management each. We will not go more in detail for the remaining smaller companies, just mention that they are owned by respectively Svenska Handelsbanken group, Kaupthing Bank, Swedish Carnegie Investment Bank AB and Danske Bank group.

8 Results

In this section we present the empirical results from the analysis. To get an overview of data material, we start by presenting descriptive statistics of mutual funds.

8.1 Descriptive Statistics

In Table 8-1 the descriptive statistics of the funds analyzed is presented.

Fond	r_p	r_p-r_f	$\sigma(r_p)$	Min r_p	Max r_p
Alfred Berg Aktiv	0,00698	0,00308	0,07443	-0,26016	0,21080
Alfred Berg Aktiv (II)	0,00996	0,00606**	0,07043	-0,18446	0,17890
Alfred Berg Norge*	0,00970	0,00581**	0,06605	-0,22379	0,13562
Alfred Berg Norge +*	0,01023	0,00634	0,06640	-0,22239	0,13582
Alfred Berg GAMBAK	0,01395	0,01005**	0,08391	-0,21957	0,28523
DnB NOR Norge (I)	0,00830	0,00440	0,06632	-0,22237	0,13480
DnB NOR Norge (III)*	0,00916	0,00526**	0,06623	-0,22230	0,13735
DnB NOR Norge Selektiv (I)	0,01078	0,00689**	0,07159	-0,22044	0,14840
DnB NOR Norge Selektiv (III)	0,00790	0,00400	0,06622	-0,22641	0,13751
Nordea Avkastning	0,00735	0,00345	0,06482	-0,19704	0,13239
Nordea Kapital	0,00815	0,00425	0,06597	-0,20724	0,13281
Nordea Norge Verdi	0,00814	0,00424	0,06218	-0,20043	0,13158
Nordea SMB	0,00967	0,00577**	0,07175	-0,18929	0,18256
Nordea Vekst	0,00633	0,00243	0,06643	-0,22303	0,13073
Storebrand Aksje Innland*	0,00911	0,00521**	0,06610	-0,23721	0,13070
Storebrand Norge	0,00802	0,00412	0,06744	-0,23493	0,14331
Storebrand Vekst	0,00655	0,00266	0,08462	-0,24570	0,36713
Storebrand Verdi*	0,01213	0,00824**	0,06450	-0,23239	0,12420
Avanse Norge (I)	0,00756	0,00367	0,06439	-0,20780	0,13564
Avanse Norge (II)	0,00671	0,00281	0,06415	-0,22051	0,13704
Carnegie Aksje Norge*	0,01082	0,00693**	0,06712	-0,20871	0,19804
Carnegie Norge Indeks*	0,00888	0,00498**	0,06621	-0,23322	0,16860
Danske Fund Norge I	0,00709	0,00319	0,06817	-0,28796	0,14057
Danske Fund Norge II	0,00778	0,00388	0,06858	-0,29487	0,14617
Danske Fund Norge Vekst	0,01054	0,00665**	0,07878	-0,20421	0,41770
Delphi Norge	0,01163	0,00774**	0,08370	-0,24933	0,23014
Delphi Vekst	0,01158	0,00769**	0,08013	-0,20045	0,25542
Handelsbanken Norge	0,00771	0,00381	0,06552	-0,21567	0,14596
Kaupthing Norge	0,01134	0,00744**	0,08342	-0,23814	0,36849
NB-Aksjefond	0,00707	0,00317	0,06306	-0,23193	0,13764
ODIN Norge	0,01158	0,00768**	0,07081	-0,21566	0,16823
Orkla Finans Investment Fund	0,00791	0,00401	0,07113	-0,24866	0,13327
PLUSS Aksje	0,00741	0,00352	0,06666	-0,25506	0,12900
PLUSS Index	0,00943	0,00553**	0,06576	-0,24096	0,16894
PLUSS Markedsverdi	0,00863	0,00473	0,06310	-0,23482	0,13425
Postbanken Norge	0,00773	0,00383	0,06652	-0,22123	0,13609
OSEFX	**0,00866**	**0,00477**	**0,06736**	**-0,25416**	**0,14237**

*Funds with higher excess return and lower standard deviation than benchmark OSEFX ** Funds with higher monthly average excess return than benchmark

Table 8-1 Descriptive statistics of funds

As shown in Table 8-1, all of the funds have a positive monthly average excess return. 16 of the funds generate a higher monthly average excess return than OSEFX, and 21 funds generate a lower standard deviation than the benchmark.

Alfred Berg GAMBAK has the second highest standard deviation (0, 08391), but also shows the highest excess return (0,01005). Investors are exposed to a higher risk, but are compensated by higher returns. The same conclusion applies for Delphi Norge. This fund has the third highest standard deviation, as well as the third highest excess return This is not the case for Storebrand Verdi, which has the second highest return above risk free rate (0, 00824), but also the sixth lowest standard deviation (0,06450). Nordea Vekst shows the lowest average excess return (0,00243) as well as becoming a number 19 in funds with highest standard deviations. This may indicate a poor performance. Avanse Norge (II) has the third lowest excess return and the fourth lowest standard deviation. The results shows that the highest standard deviation is for Storebarnd Vekst (0,08462), and it is also the fund with the second lowest average excess return. This tells us that Storebrand Vekst is the fund with the poorest performance in our analysis. The fund with the lowest standard deviation during this period is Nordea Norge Verdi (0,06218), but this fund is also number 21 when concerning excess reurn. This fund generates both low return above risk free rate and low risk.

As we can see in the table, there are seven funds that both generate both higher excess return and lower standard deviation than the benchmark OSEFX.

8.2 Error Diagnosing by Market Model

Fund	Autocorrelation: D-W	Heteroskedasticity: B-P
Alfred Berg Aktiv	1,6276	2,0303
Alfred Berg Aktiv (II)	1,7909	1,1953
Alfred Berg Norge	1,9006	0,7107
Alfred Berg Norge +	2,0825	0,5546
Alfred Berg GAMBAK	1,3912	1,5589
DnB NOR Norge (I)	2,0622	0,1309
DnB NOR Norge (III)	2,0976	0,2534
DnB NOR Norge Selektiv (I)	1,9281	4,4170
DnB NOR Norge Selektiv (III)	1,7674	0,9329
Nordea Avkastning	1,7709	11,9365*
Nordea Kapital	2,1918	8,6914*
Nordea Norge Verdi	2,1424	4,1511**
Nordea SMB	1,8656	1,8263
Nordea Vekst	1,9856	1,3976
Storebrand Aksje Innland	2,3205	0,0632
Storebrand Norge	2,3246	2,6935
Storebrand Vekst	1,5011	3,2836
Storebrand Verdi	2,3247	0,1928
Avanse Norge (I)	2,1589	4,7044**
Avanse Norge (II)	1,8471	0,1239
Carnegie Aksje Norge	1,9782	0,0052
Carnegie Norge Indeks	2,2526	0,7871
Danske Fund Norge I	1,9746	4,8554**
Danske Fund Norge II	1,9849	6,1333**
Danske Fund Norge Vekst	1,3048	3,6899
Delphi Norge	2,0941	0,1913
Delphi Vekst	1,7696	0,3386
Handelsbanken Norge	1,9660	0,0935
Kaupthing Norge	1,4835	1,4334
NB-Aksjefond	1,9849	6,1333**
ODIN Norge	1,8770	0,0119
Orkla Finans Investment Fund	1,6845	0,1551
PLUSS Aksje	2,3619	1,3140
PLUSS Index	2,2048	0,5387
PLUSS Markedsverdi	2,1619	0,2180
Postbanken Norge	2,0206	0,7810

* Over upper 1% critical values of the F distribution

** Over upper 5% critical values of the F distribution

Table 8-2 Error variable diagnosing by the market model

The requirement of no correlation in error variables is satisfied when the values of Durbin-Watson test lies between DW_u and 4- DW_u. From table 8-2 we can see that the test statistic is less than the lower critical value for 3 funds: Alfred Berg GAMBAK, Danske Fund, Norge Vekst and Kaupthing Norge. Hence, for these funds the null hypothesis of no

autocorrelation is rejected. It can be concluded that the residuals in these funds appear to be positively correlated. This is not the case for the rest of the funds.

Breusch-Pagens test for heteroskedasticity shows that the null hypothesis of homoskedasticity is rejected for 7 of 36 funds. Two of the funds, Nordea avkastning and Nordea Kapital, obtain F- statistic that is higher the critical F- values at a 1% level. The following funds have heteroskedastic error variables at a 5% level: Nordea Norge Verdi, Avanse Norge (I), Danske Fund Norge I, Danske Fund Norge II and N-B Aksjefond. For the rest of the funds, heteroskedasticity was not present.

It is possible to deal with heteroskedasticity and autocorrelation by using the Newey West method (HAC-correction), but we need a program called Eviews. We had to ignore this in our analysis, since we did not have access to this program. The consequences of ignoring autocorrelation and heteroskedasticity are discussed in section 6.3.1 and 6.3.2.

8.2 Estimated Alpha and Beta Values for the Period and Their Statistical Characteristics

Table 8-3 in next page shows the results from the regression using the single factor model.

Fund	α_p	T-value	β_p	T-value2	R^2
Alfred Berg Aktiv	-0,00170	-0,59766	1,00448	0,10596	0,82714
Alfred Berg Aktiv (II)	0,00171	0,54053	0,91317	-1,85352	0,76305
Alfred Berg Norge	0,00119	1,21707	0,96848	-2,17468**	0,97425
Alfred Berg Norge +	0,00171	1,59120	0,97102	-1,82215	0,96931
Alfred Berg GAMBAK	0,00497	1,24189	1,06589	1,11047	0,73226
DnB NOR Norge (I)	-0,00026	-0,35136	0,97772	-2,03018**	0,98535
DnB NOR Norge (III)	0,00061	0,80961	0,97597	-2,14563**	0,98470
DnB NOR Norge Selektiv (I)	0,00196	0,20348	1,03339	1,46835	0,94595
DnB NOR Norge Selektiv (III)	-0,00059	-0,47458	0,96351	-1,97380	0,95837
Nordea Avkastning	-0,00106	-0,98017	0,94746	-3,26877*	0,96716
Nordea Kapital	-0,00035	-0,34438	0,96624	-2,21251**	0,97141
Nordea Norge Verdi	0,00000	-0,00301	0,89146	-4,83291*	0,93032
Nordea SMB	0,00138	0,41162	0,92073	-1,59193	0,74340
Nordea Vekst	-0,00213	-1,39393	0,95621	-1,93342	0,93791
Storebrand Aksje Innland	0,00058	0,65788	0,97142	-2,18025**	0,97897
Storebrand Norge	-0,00060	-0,64259	0,99061	-0,68050	0,97760
Storebrand Vekst	-0,00237	-0,56160	1,05481	0,87482	0,70607
Storebrand Verdi	0,00395	1,94649	0,89960	-3,33602*	0,88334
Avanse Norge (I)	-0,00085	-0,97950	0,94686	-4,14300*	0,97880
Avanse Norge (II)	-0,00167	-1,72122	0,94118	-4,07676*	0,97302
Carnegie Aksje Norge	0,00234	1,44504	0,96250	-1,56302	0,93170
Carnegie Norge Indeks	0,00037	0,34109	0,96715	-2,04098	0,96835
Danske Fund Norge I	-0,00149	-0,98748	0,98140	-0,83213	0,94231
Danske Fund Norge II	-0,00082	-0,52423	0,98556	-0,62633	0,93934
Danske Fund Norge Vekst	0,00218	0,50199	0,93793	-0,96529	0,64328
Delphi Norge	0,00237	0,72945	1,12650	2,62699*	0,82263
Delphi Vekst	0,00272	0,76448	1,04189	0,79434	0,76785
Handelsbanken Norge	-0,00075	-0,69215	0,95785	-2,61825*	0,96774
Kaupthing Norge	0,00222	0,62230	1,09589	1,81270	0,78434
NB-Aksjefond	-0,00121	-0,52423	0,91912	-0,62633	0,96433
ODIN Norge	0,00312	1,15320	0,95703	-1,07084	0,82816
Orkla Finans Investment Fund	-0,00086	-0,52935	1,02226	0,92052	0,93806
PLUSS Aksje	-0,00106	-0,74165	0,96111	-1,82650	0,94527
PLUSS Index	0,00097	0,83209	0,95754	-2,46322**	0,96316
PLUSS Markedsverdi	0,00033	0,34183	0,92348	-5,36705*	0,97264
Postbanken Norge	-0,00084	-1,10326	0,98049	-1,72473	0,98454

1 Significantly different from 0 at 1%

2 Significantly different from 0 at 5%

*significantly different from 1 at 1%

** significantly different from 1 at 5%

Table 8-3 Estimated alpha and beta values

As shown in the table 8-3, 19 of 36 funds generate a positive alpha value, with Alfred Berg GAMBAK (0, 00497) in first place followed by Storebrand Verdi (0, 00395) and ODIN Norge (0, 00312). It is noteworthy that no α values are significantly different from 0, implying that we could not reject the null hypothesis of 0 abnormal returns. These results are not consistent with the investments strategy of these funds. This is consistent with Gjerde and Sættem (1991), since they could not find alpha values significantly different from zero when analyzing 14 funds. A positive alpha might tell us that funds managers have the ability to beat the market. It seems to be that these funds do not generate returns over a normal compensation for risk, since the alpha values in this analysis are not significantly different from zero.The three funds with lowest α values are Storebrand Vekst (-0, 00237), Nordea vekst(-0, 00213) and Alfred Berg Aktiv (-0, 00170). These funds also have a somewhat poorer result in our further analysis.

Beta is a measure of a fund's sensitivity to market movements. Thus, it is a measure of systematic risk, where the market's beta equals 1. We noted that 28 beta estimates were below 1 and 8 above 1. This opposes Gjerde and Sættem (1991), whom came to the conclusion that the beta values of the funds analyzed were less than one. Delphi Norge has the highest beta value (1,12650). The funds with the second and third highest beta values are Kaupthing Norge (1,09589) and ALFRED BERG GAMBAK (1,06589), respectively. 6 funds had betas significantly different from one at 5% level, and 8 funds at 1% level. Nordea Norge Verdi had the lowest beta value of (0,89146) followed by Storebarnd Verdi (0,89960) and Alfred Berg Aktiv (II) (0,91317). These low beta values has to be seen in connection with R^2 and the market index used.

There are 17 funds claiming to have higher risk than the market, despite the fact that the beta values of these funds are lower than the market. To some extent this could be explained by the fact that funds were restricted from borrowing in the capital markets, which narrowed the manager's opportunity set of risky portfolios. Furthermore, only a minor proportion of the funds assets were held in fixed-income securities.

As we can see in table 8-3, individual funds within the same management company have a remarkable similar risk profile measured by beta values. This result is consistent with Gjerde and Sættem (1991) studies. We cannot reject the hypothesis that related funds have equal beta coefficient. This result opposes the common claim that individual funds within the same company follows different investment policies.

R^2 tell us how much of the variance of the funds' excess return which is explained by the variance of the market index. A high R^2 indicates low unsystematic risk and consequently a well diversified portfolio. In this analysis, R^2 varies from 64,33% to 98,53%. Overall, this coefficient is high in our sample. Hence, for nearly all of the funds systematic risk is the main element of total risk. Danske Fund Norge Vekst obtained the lowest R^2 value (64,33%), and this fund obtains also a low beta. This fund use OSESX as the reference index, and these results are consistent with their strategy to actively deviate from the index. DnB NOR Norge(I) and DnB NOR Norge (III) were the funds with highest systematic risk, with R^2 values of 98,53% and 98,47% respectively. DnB NOR Norge (I) is a fund of funds with DnB NOR Norge (IV). The high R-squared of these DnB NOR Funds corresponds to their investments strategy of reflecting the market portfolio as much as possible.

8.3 Performance Evaluation of Funds

In this part, we will present the performance evaluation of the funds, based on the different measures explained in the theory section. Table 8-4 in next page, shows the results of calculating four measures and ranking all the funds based on each measure. The number beside each measure indicates ranking postition. Fund with best performance is ranked as number1, and number 36 shows the poorest performance.

Fund	Sharp	Rank	Treynor	Rank	Jensen Alpha	Rank	M^2	Rank
Alfred Berg Aktiv	0,0414	34	0,0031	33	-0,0017	34	-0,002	34
Alfred Berg Aktiv (II)	0,0860*	11	0,0066*	10	0,0017	10	0,001	11
Alfred Berg Norge	0,0879*	10	0,0060*	13	0,0012	13	0,0012	10
Alfred Berg Norge +	0,0954*	7	0,0065*	11	0,0017	11	0,0017	7
Alfred Berg GAMBAK	0,1198*	2	0,0094*	1	0,0050	1	0,0033	2
DnB NOR Norge (I)	0,0664	20	0,0045	20	-0,0003	20	-0,0003	20
DnB NOR Norge (III)	0,0795*	15	0,0054*	15	0,0006	15	0,0006	15
DnB NOR Norge Selektiv (I)	0,0962*	5	0,0067*	9	0,0020	9	0,0017	5
DnB NOR Norge Selektiv (III)	0,0604	23	0,0042	23	-0,0006	22	-0,0007	23
Nordea Avkastning	0,0533	29	0,0036	30	-0,0011	29	-0,0012	29
Nordea Kapital	0,0644	21	0,0044	21	-0,0004	21	-0,0004	21
Nordea Norge Verdi	0,0683	19	0,0048	19	0,0000	19	-0,0002	19
Nordea SMB	0,0804*	14	0,0063*	12	0,0014	12	0,0007	14
Nordea Vekst	0,0366	35	0,0025	35	-0,0021	36	-0,0023	35
Storebrand Aksje Innland	0,0789*	16	0,0054*	16	0,0006	16	0,0005	16
Storebrand Norge	0,0611	22	0,0042	22	-0,0006	23	-0,0006	22
Storebrand Vekst	0,0314	36	0,0025	36	-0,0024	35	-0,0027	36
Storebrand Verdi	0,1277*	1	0,0092*	2	0,0040	2	0,0038	1
Avanse Norge (I)	0,0569	26	0,0039	28	-0,0008	27	-0,0009	26
Avanse Norge (II)	0,0438	33	0,003	34	-0,0017	33	-0,0018	33
Carnegie Aksje Norge	0,1032*	4	0,0072*	5	0,0023	6	0,0022	4
Carnegie Norge Indeks	0,0752*	17	0,0051*	17	0,0004	17	0,0003	17
Danske Fund Norge I	0,0468	32	0,0033	32	-0,0015	32	-0,0016	32
Danske Fund Norge II	0,0566	27	0,0039	25	-0,0008	25	-0,001	27
Danske Fund Norge Vekst	0,0844*	12	0,0071*	6	0,0022	8	0,0009	12
Delphi Norge	0,0925*	8	0,0069*	7	0,0024	5	0,0015	8
Delphi Vekst	0,0959*	6	0,0074*	4	0,0027	4	0,0017	6
Handelsbanken Norge	0,0582	24	0,0040	24	-0,0008	24	-0,0008	24
Kaupthing Norge	0,0892*	9	0,0068*	8	0,0022	7	0,0012	9
NB-Aksjefond	0,0503	31	0,0035	31	-0,0012	31	-0,0014	31
ODIN Norge	0,1085*	3	0,008*	3	0,0031	3	0,0025	3
Orkla Finans Investment Fund	0,0564	28	0,0039	26	-0,0009	28	-0,001	28
PLUSS Aksje (Fondsforval)	0,0528	30	0,0037	29	-0,0011	30	-0,0012	30
PLUSS Index (Fondsforvaltn)	0,0841*	13	0,0058*	14	0,0010	14	0,0009	13
PLUSS Markedsverdi (Fondsforv)	0,0750*	18	0,0051*	18	0,0003	18	0,0003	18
Postbanken Norge	0,0576	25	0,0039	27	-0,0008	26	-0,0009	25
OSEFX	**0,0708**		**0,0048**					

* Higher performance than market index

Table8-4 Ranking based on different performance measures with OSEFX as market index

8.3.1 Performance Evaluation Based on The Sharpe Measure

As we can see in the table, there are 18 funds which have outperformed the market index OSEFX. The Sharpe ratio for the market index was 0, 070764. There are no negative Sharpe ratio, which indicate that these funds have done better than the interest rate market during the period analyzed.

Ranking based upon the Sharpe ratio give us the following best three funds:

1. Storebrand Verdi
2. Alfred Berg GAMBAK
3. Odin Norge.

The funds ranked poorest according to the Sharpe ratio are:

34. Alfred Berg Aktiv
35. Nordea Vekst
36. Storebrand Vekst.

8.3.2 Performance Evaluation Based on The Treynor Ratio

The ranking based on the Treynor ratio differ somewhat from the Sharpe ratio. This can be due to the differing standard deviation of funds in some periods. The ranking based on these two measures are identical for 15 of the funds, while for the rest of the funds the difference is rather small. An exception is Danske Fund Norge Vekst which is ranked as number 6 by the Treynor ration, but as number 12 by the Sharpe ratio. 18 funds have a higher Treynor ratio than the market index. These funds are identical to the ones outperforming the market index when using the Sharpe ratio.

In addition, we have ranked the funds using the Adjusted Alpha. The results of the ranking were exactly the same as for the Treynor ratio. Since Jensen's Alpha is a more commonly used measure, we only included Jensen's Alpha.

The three best ranked funds based upon the Treynor ratio are as follows:

1. Alfred Berg GAMBAK
2. Storebarnd Verdi
3. Odin Norge.

The following funds were ranked poorest:

34. Avanse Norge (ii)
35. Nordea vekst
36. Storebrand vekst.

8.3.3 Performance Evaluation Based on The Jensen's Alpha

Ranking of the funds on the basis of the Jensen's alpha is rather similar to the Treynor ratio. 21 funds have the exact same ranking as the one derived from the Treynor ratio. As can be seen, 17 of the funds have a negative alpha; therefore they do not have the ability to generate risk adjusted excess return over the risk free rate.

The best funds when considering Jensen's alpha are:

1. Alfred Berg GAMBAK
2. Storebrand Verdi
3. Odin Norge

The poorest ranked funds are:

34. Alfred Berg Aktiv
35. Storebrand Vekst
36. Nordea Vekst

8.3.4 Performance Evaluation Based on Modigliani and Modigliani

Ranking based on the Modigliani and Modigliani measure (M^2) gives an identical ranking as the Sharpe ratio. This is because the M^2 is a linear function of the Sharpe ratio. There are 18 funds with positive M^2 values, and these are the same funds that outperformed the market when using the Sharpe and Treynor ratio.

Funds ranked best according to the M^2 measure are the following:

1. Storebrand Verdi
2. Alfred Berg GAMBAK
3. Odin Norge

The funds ranked lowest are:

34. Alfred Berg Aktiv
35. Nordea vekst
36. Storebrand vekst

8.3.5 Summary Ranking Based on all Performance Measures

Table 8-5 in next page, shows the ranking based on the results of all measures, and we find a similarity between them.

Fund	Sharp	Treynor	Adj. Alpha	Jensen Alpha	M^2
Alfred Berg Aktiv	34	33	33	34	34
Alfred Berg Aktiv II	11	10	10	10	11
Alfred Berg Norge	10	13	13	13	10
Alfred Berg Norge +	7	11	11	11	7
GAMBAK	2	1	1	1	2
DnB NOR Norge (I)	20	20	20	20	20
DnB NOR Norge (III)	15	15	15	15	15
DnB NOR Norge Selektiv (I)	5	9	9	9	5
DnB NOR Norge Selektiv (III)	23	23	23	22	23
Nordea Avkastning	29	30	30	29	29
Nordea Kapital	21	21	21	21	21
Nordea Norge Verdi	19	19	19	19	19
Nordea SMB	14	12	12	12	14
Nordea Vekst	35	35	35	36	35
Storebrand Aksje Innland	16	16	16	16	16
Storebrand Norge	22	22	22	23	22
Storebrand Vekst	36	36	36	35	36
Storebrand Verdi	1	2	2	2	1
Avanse Norge (I)	26	28	28	27	26
Avanse Norge (II)	33	34	34	33	33
Carnegie Aksje Norge	4	5	5	6	4
Carnegie Norge Indeks	17	17	17	17	17
Danske Fund Norge I	32	32	32	32	32
Danske Fund Norge II	27	25	25	25	27
Danske Fund Norge Vekst	12	6	6	8	12
Delphi Norge	8	7	7	5	8
Delphi Vekst	6	4	4	4	6
Handelsbanken Norge	24	24	24	24	24
Kaupthing Norge	9	8	8	7	9
NB-Aksjefond	31	31	31	31	31
ODIN Norge	3	3	3	3	3
Orkla Finans Investment Fund	28	26	26	28	28
PLUSS Aksje	30	29	29	30	30
PLUSS Index	13	14	14	14	13
PLUSS Markedsverdi	18	18	18	18	18
Postbanken Norge	25	27	27	26	25

Table 8-5 Summary ranking based on all performance measures

The Sharpe and M^2 measure give identical ranking. This is also the case for the adjusted Jensen's Alpha and the Treynor ratio. Alfred Berg GAMBAK, ODIN Norge and Storebrand Verdi are the three best funds according to all of the measures. However, there are some minor differences concerning which fund ranked best. A reason for the good performance of these funds could be the active management. The Alfred Berg GAMBAK fund manager's objective is to achieve the best possible risk-adjusted return through an actively managed portfolio of investing in Norwegian companies, which are unique in their market. This fund does not follow any direct reference index. Storebrand Verdi's best

performance could be explained bye the strategy of investing in shipping, offshore and finance industry, which is characterized by a relative stable and predictable earnings.The three funds with poorest performance according to the Sharpe ratio, Jensen's Alpha and the M^2 measure, are Alfred Berg Aktiv, Nordea vekst and Storebarnd Vekst. The Treynor ratio and the adjusted Jensen's Alpha, have Avanse Norge (II) ranked poorest, instead of Alfred Berg Aktiv. As mentioned before, we have used OSEFX as a market index for all of the funds, even several of the funds use OSEBX as their benchmark. All these three best and worst funds use OSEFX as their reference index, with the exception of Storebarnd Vekst which use OSEBX. One cannot argue that the reference index is the reason for the poor performance of Alfred berg Aktive and Nordea vekst.

8.3.6 Performance Evaluation Based on Appraisal Ratio

The estimated values for the Appraisal Ratio (AR), with OSEFX as a market index, are presented in table 8-6 in. When calculating the AR, it is essential to use each fund's associated reference index as the market index to obtain a correct result. Funds with the highest AR values are ranked as the best. A positive (negative) AR value indicates that the fund has done better (worse) than its market index.

Fund	AR	Rank
Alfred Berg Aktiv	-0,0547	15
Alfred Berg Aktiv II	0,0495	9
Alfred Berg Norge	0,1114	4
Alfred Berg Norge +	0,1456	1
GAMBAK	0,1137	3
Nordea Avkastning	-0,0897	20
Nordea Kapital	-0,0315	12
Nordea Norge Verdi	-0,0003	11
Nordea Vekst	-0,1276	22
Storebrand Norge	-0,0588	16
Avanse Norge (I)	-0,0896	19
Avanse Norge (II)	-0,1575	23
Carnegie Aksje Norge	0,1322	2
Danske Fund Norge I	-0,0904	21
Danske Fund Norge II	-0,0480	13
Delphi Norge	0,0668	7
Delphi Vekst	0,0700	6
Handelsbanken Norge	-0,0633	17
Kaupthing Norge	0,0570	8

Fund	AR	Rank
ODIN Norge	0,1055	5
Orkla Finans Investment Fund	-0,0484	14
PLUSS Aksje	-0,0679	18
PLUSS Markedsverdi	0,0313	10

Table 8-6 Estimated Appraisal Ratio for funds with OSEFX as market index

The ranking based on AR differ from the other measures. As shown in table X, 13 of the 23 funds have a negative Appraisal Ratio The best funds according to the AR are Alfred Berg Norge +, Carnegie Aksje Norge and Alfred Berg GAMBAK, respectively. The table also shows that Danske Fund Norge I, Nordea Vekst and Avanse Norge (II) are the funds with poorest performance. The two latter funds were also the worst using the Treynor ratio and the adjusted Jensen's Alpha.

There are 9 funds which use OSEBX as market index, and they are ranked in table 8-7. As shown in the table, 5 funds have a negative AR. The best fund is Storebrand Verdi, and Postbanken Norge is the fund with the poorest performance. Storebrand Verdi has also performed very well according to the other previous measures.

Fund	AR	Rank
DnB NOR Norge (I)	-0,0595	7
DnB NOR Norge (III)	0,0652	3
DnB NOR Norge Selektiv (I)	0,1065	2
DnB NOR Norge Selektiv (III)	-0,0482	5
Storebrand Aksje Innland	0,0480	4
Storebrand Vekst	-0,0498	6
Storebrand Verdi	0,1952	1
NB-Aksjefond	-0,0918	8
Postbanken Norge	-0,1466	9

Table 8-7 Estimated Appraisal ratio for funds with OSEBX as market index

Table 8-8 and 8-9 in next page shows the funds using OSESX and OBX as their market index. All the estimated Appraisal values are negative.

Fund	AR	Rank
Danske Fund Norge Vekst	-0,0767	1
Nordea SMB	-0,1602	2

Table 8-8 Estimated Appraisal ratio for funds with OSESX as market index

Fund	AR	Rank
Pluss Index	-0,03269	1
Carnegie Norge Indeks	-0,15408	2

Table 8-9 Estimated Appraisal ratios for funds with OBX as market index

In table8-10, the ranking of the funds is presented, by using OSEFX as the market index for all of the funds. In addition to present Appraisal Ratio for funds with each their respective market index in separate tables, we have collected all the funds in one table whether they use OSEFX, OSEBX, OBX or OSESX. In the left side of 8-10, AR ratio is calculated by using each fund's respective market index and in the right side by using OSEFX as the market index for all of the funds. We have presented both to show the importance of using correct market index when calculating AR ratio.

Fund	AR	Rank	AR with OSEFX	Rank2
ABN AMRO Aktiv	-0,0547	22	-0,0547	26
ABN AMRO Kapital	0,0495	12	0,0495	14
ABN AMRO Norge	0,1114	5	0,1114	6
ABN AMRO Norge +	0,1456	2	0,1456	2
GAMBAK	0,1137	4	0,1137	5
DnB NOR Norge (I)	-0,0595	24	-0,0322	21
DnB NOR Norge (III)	0,0652	10	0,0741	9
DnB NOR Norge Selektiv (I)	0,1065	6	0,1170	4
DnB NOR Norge Selektiv (III)	-0,0482	19	-0,0434	22
Nordea Avkastning	-0,0897	29	-0,0897	31
Nordea Kapital	-0,0315	16	-0,0315	20
Nordea Norge Verdi	-0,0003	15	-0,0003	19
Nordea SMB	-0,1602	36	0,0377	16
Nordea Vekst	-0,1276	32	-0,1276	35
Storebrand Aksje Innland	0,0480	13	0,0602	12
Storebrand Norge	-0,0588	23	-0,0588	27
Storebrand Vekst	-0,0498	21	-0,0514	25
Storebrand Verdi	0,1952	1	0,1781	1
Avanse Norge (I)	-0,0896	28	-0,0896	30
Avanse Norge (II)	-0,1575	35	-0,1575	36
Carnegie Aksje Norge	0,1322	3	0,1322	3
Carnegie Norge Indeks	-0,1541	34	0,0312	18
Danske Fund Norge I	-0,0904	30	-0,0904	23
Danske Fund Norge II	-0,0480	18	-0,0480	32
Danske Fund Norge Vekst	-0,0767	27	0,0459	15
Delphi Norge	0,0668	9	0,0668	11
Delphi Vekst	0,0700	8	0,0700	10
Handelsbanken Norge	-0,0633	25	-0,0633	28
Kaupthing Norge	0,0570	11	0,0570	13
NB-Aksjefond	-0,0918	31	-0,1009	33
ODIN Norge	0,1055	7	0,1055	7
Orkla Finans Investment Fund	-0,0484	20	-0,0484	24
PLUSS Aksje	-0,0679	26	-0,0679	29
PLUSS Index	-0,0327	17	0,0761	8
PLUSS Markedsverdi	0,0313	14	0,0313	17
Postbanken Norge	-0,1466	33	-0,1010	34

Table 8-10 Estimated Appraisal ratio for funds with their own market index and AR ratio for all funds with OSEFX as market index

As we can see, those two rank differently but the three best funds are the same. Funds with best performance are as following: Storebrand Verdi, Alfred Berg Norge+ and Carnegie Aksje Norge. As shown in the table, the fund with poorest performance is Nordea SMB

when we use each funds respective market index, but this fund comes to a sixteenths place according to AR in the right side of table.

8.4 Performance Persistence

In this section we present results from the two performance persistence tests. Our findings are summarized in Table 8-11.

	Persistence of unadjusted rate of return				Persistence of Jensens' alpha			
	WW, WL, LL and LW Pairs				WW, WL, LL and LW Pairs			
	Winners	Losers	WW	Z-value	Winners	Losers	CPR	Z-value
1999								
Winners	4	14	22,22 %	-1,17851	4	2	1,333333	0,305133
Losers	14	4			18	12		
2000								
Winners	7	11	38,89 %	-0,4714	7	15	0,466667	-1,083
Losers	11	7			7	7		
2001								
Winners	12	6	66,67 %	0,707107	6	8	2	0,960453
Losers	6	12			6	16		
2002								
Winners	12	6	66,67 %	0,707107	7	5	1,96	0,938376
Losers	6	12			10	14		
2003								
Winners	6	12	33,33 %	-0,70711	5	12	0,902778	-0,1409
Losers	12	6			6	13		
2004								
Winners	9	9	50,00 %	0	6	5	1,8	0,80486
Losers	9	9			10	15		
2005								
Winners	9	9	50,00 %	0	4	12	1	0
Losers	9	9			5	15		
2006								
Winners	11	7	61,11 %	0,471405	5	4	1,5625	0,576154
Loosers	7	11			12	15		
2007								
Winners	8	10	44,44 %	-0,2357	11	6	0,34375	-1,32103
Loosers	10	8			16	3		
1999-2007			**Average**				**Average**	
Winers	78	84	**48,15 %**		55	69	**0,974235**	
Losers	84	78			90	110		

Table 8-11 Performance Persistence Tests

8.4.1 Persistence of Rate of Return

With our small sampling material we cannot reject the null hypothesis for any year ($|z|=1,96$ for 5 % significance level). This means that we cannot conclude that there exists

any performance persistence among Norwegian equity funds. Nevertheless, we can observe that the percentage of repeated Winners vary greatly from year to year, and as many as 78% of the 1999 Winners turned into Losers in year 2000.

This reversal trend is observed in 4 out of 9 years. The general trend during the period seems to be that if a fund outperforms 50 % of it's peers in period *t-1*, it is more likely that in period *t* the fund will find itself in the lower half when it comes to performance. This is because, on average, only 48,15% of the Winners tend to stay Winners also the following year. However, these observations have no statistical significance.

8.4.2 Persistence of Portfolio's Alpha

This test shows similar results as persistence of rate of return test. As we recall CPR ratio equal to 1 means that 50 % of last periods Winners stay Winners in the preceding period, while CPR<1 indicates that more than 50 % of the last years Winners have turned into the current years Losers.
None of the years shows statistically significant positive or negative performance persistence.

Both relative and absolute tests show that there is no performance persistence in Norwegian equity funds' performance during the period 1998-2007. As several studies indicate that the results vary depending on the period studied, we cannot generalize these conclusions to any other time period.

It is worth noting that our results are exposed to bias in our data set, since we have looked only at funds that have been in existence during the *whole* observation period, leaving out funds that were started after 1998 and those that ceased to exist before March 2008. However, our findings are consistent with studies that search for performance persistence in mutual fond industry in Italy (Casarin et al (2002)), Danmark (Christensen (2005)) and Britain (Keswani, Stolin (2005)).

8.5 Market Timing

In this subsection we present results from Treynor, Mazuy (TM) and Henriksson, Merton (HM) market timing tests for Norwegian equity funds.

Table 8-12 displays results from TM equation where we use OSEAX index as a benchmark. Estimates marked with dark blue are statistically significant with 5% confidence interval.

Fund	α_p	T-value	Gamma	T-value	R^2
Alfred Berg Aktiv	-0,00289	-0,84781	-0,1748	-0,39185	0,830181
Alfred Berg Aktiv (II)	-0,00058	-0,15379	0,126662	0,256908	0,768456
Alfred Berg Norge	-0,00061	-0,37027	0,009357	0,043542	0,950071
Alfred Berg Norge +	-0,00023	-0,13631	0,03847	0,175432	0,948539
Alfred Berg GAMBAK	0,001298	0,273526	0,383456	0,616778	0,740661
DnB NOR Norge (I)	-0,0021	-1,51005	0,013153	0,072163	0,964354
DnB NOR Norge (III)	-0,00125	-0,88598	0,020047	0,108186	0,963049
DnB NOR Norge Selektiv (I)	-0,00032	-0,13529	0,104516	0,339928	0,912828
DnB NOR Norge Selektiv (III)	-0,00181	-0,99809	-0,13043	-0,54956	0,939471
Nordea Avkastning	-0,00319	-1,63546	0,110113	0,43105	0,926811
Nordea Kapital	-0,00216	-1,13468	0,024579	0,098508	0,932567
Nordea Norge Verdi	-0,00201	-0,81567	0,118361	0,367033	0,873267
Nordea SMB	-0,00512	-1,32787	1,117373	2,213692	0,767419
Nordea Vekst	-0,00384	-1,70068	0,000825	0,002789	0,9066
Storebrand Aksje Innland	-0,00072	-0,50672	-0,11489	-0,61408	0,962198
Storebrand Norge	-0,00158	-0,85626	-0,18406	-0,76384	0,93978
Storebrand Vekst	-0,00591	-1,11153	0,397417	0,570883	0,679856
Storebrand Verdi	0,002235	1,074664	-0,02415	-0,08864	0,915651
Avanse Norge (I)	-0,00209	-1,17443	-0,1	-0,42866	0,938153
Avanse Norge (II)	-0,00272	-1,52005	-0,1474	-0,62801	0,937005
Carnegie Aksje Norge	-0,00128	-0,60367	0,436312	1,577041	0,919864
Carnegie Norge Indeks	-0,0013	-0,87283	-0,03247	-0,16668	0,959096
Danske Fund Norge I	-0,00116	-0,51089	-0,49475	-1,67074	0,910687
Danske Fund Norge II	-0,00052	-0,22679	-0,4875	-1,61668	0,908462
Danske Fund Norge Vekst	-0,00054	-0,10574	0,210198	0,312345	0,65526
Delphi Norge	-0,00314	-0,75001	0,836456	1,523358	0,796543
Delphi Vekst	-0,00307	-0,6876	0,934339	1,598147	0,748318
Handelsbanken Norge	-0,00185	-1,09336	-0,15468	-0,69886	0,946207
Kaupthing Norge	-0,00391	-0,91862	0,96603	1,731976	0,788498
NB-Aksjefond	-0,00094	-0,45529	-0,43727	-1,61035	0,912385
ODIN Norge	0,000282	0,083815	0,253984	0,576205	0,817117
Orkla Finans Investment Fund	-0,00126	-0,50921	-0,33419	-1,02915	0,901468
PLUSS Aksje	-0,00201	-0,87789	-0,17628	-0,5885	0,904419
PLUSS Index	2,75E-05	0,01655	-0,19673	-0,90251	0,948038
PLUSS Markedsverdi	-0,00018	-0,09603	-0,25942	-1,03913	0,926
Postbanken Norge	-0,00313	-2,23681	0,117206	0,640151	0,964262
				Average:	**0 ,883432**

Table 8-12 Treynor Mazuy Market Timing Model

Just 4 funds show positive alpha - PLUSS Index, ODIN Norge, Storebrand Verdi and Alfred Berg GAMBAK. Theses funds according to TM model demonstrate the ability to identify and include in their portfolios underpriced stocks, rest of the 36 funds show negative stock picking ability. Postbanken Norge fund exhibits negative alpha and is the only fund in the sample with statistically significant alpha value.

16 funds show negative gamma value. These funds have maid wrong predictions about market movements and acted on them thus dragging down their portfolio performance. The remaining 20 funds exhibit positive market timing ability. The best market timer according to TM model is Nordea SMB fund with the highest gamma and it is also the only one that is statistically significant. However if we use OSEBX as a benchmark for gamma estimation we get gamma equal to 0,88660 that is not statistically significant, while OSEFX index gives us significant value of 0,937680, which is lower than the value we obtain with OSEAX index exhibited in the table above 1,117373.

Next table 8-13 summarizes results from Henriksson and Merton test with OSEAX index as a market proxy.

Fund	**α_p**	**T-value**	**Gamma**	**T-value**	**R^2**
Alfred Berg Aktiv	5,9E-05	0,012339	-0,14435	-0,95642	0,831277
Alfred Berg Aktiv (II)	0,001399	0,264109	-0,05672	-0,33903	0,768553
Alfred Berg Norge	0,000957	0,415599	-0,05983	-0,82257	0,950357
Alfred Berg Norge +	0,001319	0,415599	-0,05436	-0,82257	0,94876
Alfred Berg GAMBAK	0,002811	0,419885	0,003849	0,018211	0,739819
DnB NOR Norge (I)	-0,00059	-0,30359	-0,057	-0,92468	0,964611
DnB NOR Norge (III)	0,000115	0,057824	-0,05036	-0,80284	0,963248
DnB NOR Norge Selektiv (I)	0,000837	0,253258	-0,02807	-0,26895	0,912796
DnB NOR Norge Selektiv (III)	0,000357	0,140883	-0,10642	-1,32926	0,940217
Nordea Avkastning	-0,00209	-0,76045	-0,02502	-0,28847	0,926746
Nordea Kapital	-0,00034	-0,12638	-0,06747	-0,79873	0,932927
Nordea Norge Verdi	-0,0007	-0,20108	-0,03192	-0,29154	0,873213
Nordea SMB	-0,00956	-1,75871	0,358458	2,087517	0,766379
Nordea Vekst	-0,00317	-0,99612	-0,0263	-0,2621	0,906655
Storebrand Aksje Innland	0,001043	0,522283	-0,08823	-1,39869	0,9627
Storebrand Norge	0,001094	0,426423	-0,13503	-1,6661	0,940882
Storebrand Vekst	-0,00562	-0,74987	0,054107	0,228711	0,679108
Storebrand Verdi	0,001975	0,674495	0,006217	0,067222	0,915648
Avanse Norge (I)	-1E-05	-0,0041	-0,09811	-1,24618	0,938867
Avanse Norge (II)	-0,00084	-0,33611	-0,09801	-1,23611	0,937608
Carnegie Aksje Norge	-0,00165	-0,5526	0,086765	0,917532	0,918745
Carnegie Norge Indeks	-0,00011	-0,05189	-0,05201	-0,78855	0,959302

Fund	α_p	T-value	Gamma	T-value	R^2
Danske Fund Norge I	0,000988	0,310202	-0,16554	-1,64631	0,910627
Danske Fund Norge II	0,001316	0,405165	-0,15237	-1,48617	0,908151
Danske Fund Norge Vekst	0,001702	0,235215	-0,05343	-0,23386	0,655134
Delphi Norge	-0,00433	-0,72982	0,184386	0,983675	0,79421
Delphi Vekst	-0,00317	-0,50106	0,158047	0,789961	0,744188
Handelsbanken Norge	0,00058	0,245834	-0,12068	-1,62078	0,947169
Kaupthing Norge	-0,00623	-1,03434	0,25023	1,31468	0,786233
NB-Aksjefond	0,001962	0,67652	-0,186	-2,03093	0,913493
ODIN Norge	0,002444	0,515149	-0,04293	-0,28665	0,816727
Orkla Finans Investment Fund	0,001879	0,541862	-0,17825	-1,62801	0,902779
PLUSS Aksje	-0,00086	-0,26591	-0,07422	-0,73058	0,904572
PLUSS Index	0,001663	0,712474	-0,09655	-1,30991	0,948432
PLUSS Markedsverdi	0,001999	0,748806	-0,12832	-1,52211	0,926768
Postbanken Norge	-0,0021	-1,06726	-0,02084	-0,33482	0,964171

Table 8-13 Henriksson Merton Market Timing Model

45 % (16 funds) of funds exhibit negative alpha value, while 55 % show positive stock picking ability. However none of these values are statistically significant.
8 funds according to HM model did have positive market timing ability, the rest show negative gamma value and negative market timing ability. HM test gives us 2 statistically significant gamma values. Nordea SMB shows positive market timing ability, while NB-Aksjefond shows significant negative market timing ability.

TM test finds less funds with positive stock picking abilities than HM, respectively 4 and 20 funds show positive alpha values, at the same time TM test finds more funds with positive market timing abilities than HM test, respectively 20 vs 8. However TM and HM tests gives us just 2 values each that are statistically significant. Both identify Nordea SMB fond as a successful market timer with significant gamma values. While both tests shows negative stock picking abilities of Postbanken Norge only TM test gives it a statistically significant value. As well both test show negative market timing ability of NB-Aksjefond, but only HM test assigns it statistically significant value. These results coincide with study performed for Danish mutual funds where Christensen (2005) finds 2 funds with significant market timing ability out of 47.

TM and HM test when using OSAX as a benchmark, do not show the negative correlation between alpha and gamma values that many market timing studies have exhibited.

However when using OSEFX index as a benchmark for alpha and gamma estimates in TM and HM tests we did find negative correlation between market timing and stock picking ability. Furthermore different benchmark indexes influence TM and HM tests significantly. While using OSEFX index for TM test we found that almost 40 % of funds exhibited positive statistically significant market timing ability and 11% of funds showed statistically significant negative stock picking ability. We found similar results for HM test that exhibited negative stock picking abilities and positive market timing abilities. These findings coincide with those of Gjerde og Sættem (1991).

When estimating gamma and alpha values with OSEBX index we got results from TM test that 14% of funds can time market and just one fund exhibited negative significant stock picking ability.

It seems that the closer our benchmark is to the "real" market portfolio the less pronounced market and stock picking abilities we find using TM and HM tests. OSEAX index is the less restricting of the three indices we have used, while OSEBX is adjusted so that it could be copied by investors in real life, while OSEFX restricts the investment possibilities further as to comply with the restrictions fund managers face.

Probably more of the sample funds would show market timing abilities and they would be stronger if we would use daily data, since that would coincide better with timing frequency of managers. Our data also do not satisfy the assumptions made by the models that all fund managers in the sample pursue market timing strategy and that they all have the same reaction function to market forecasts. And we can guess that some of our funds do not comply with the assumptions of heteroskedasticity and normal distributions for error terms that are made by regression model thus distorting our results.

We conclude that market timing ability for Norwegian equity funds is rare as only one fund out of 36 exhibited positive significant positive market timing ability by TM and HM tests.

8.6 Consolidation and Performance

As we mention earlier mutual funds industry has undergone consolidation process during the last decade. In this section we look at weather mergers and acquisitions of funds and

their management companies have influenced the performance of individual funds. It is argued that fund managers loosing the ownership of the company will perform worse due to less incentive for making their outmost effort. It has been publicly discussed that the continuous merger and acquisition process in the industry causes changing management environment for fund managers thus affecting their performance.

We will examine the performance of funds managed by 4 stand-alone asset management companies that were bought by larger financial groups. We will also look at the case when 4 capital management companies owned by bigger financial institutions were merged into one.

We proceed by evaluating the individual fund performance 3 years before and 3 years after the acquisition using M^2 and adjusted Jensen's alpha. We have to dismiss Sharpe, Treynor and Jensen's alpha measures, as they are not suited to comparing funds performances across time periods.

In the table below we give short information on the acquisitions that we investigate.

Company Name	**Acquisition year**	**Comments**	**Funds in our sample**
Stand-alone companies bought by financial groups			
Odin Forvaltning	January 2000	In 1996 SpareBank 1 Gruppen AS bought 51 % of the company with the right to buy the rest of company until 2000.	Odin Norge
Gambak Fondsforvaltning	December 2003	After tow years of underperformance bought by ABN AMRO group that already owned 34 % of the company before.	Alfred Berg Aktiv II Alfred Berg Gambak
Delhpi Fondsforvaltning	July 2002	Bought by Storebrand group. In 1995 Delphi Fondsforvaltning acquired Norse Forvaltning.	Delphi Norge Delphi Veks
Industrifinans Fondsforvaltning	June 2000	Bought by ABN AMRO group, merged with Alfred Berg Forvaltning that was owned by ABN AMRO.	Alfred Berg Norge Alfred Berg Norge + Alfred Berg Aktiv
Merger between asset management companies owned by financial groups			
Avanse Forvaltning	June 2004	Norwegian oldest equity fund started in 1966. Three companies were merged into DnB NOR Kapitalforvaltning (Avanse Forvaltning, DnB Investor og Gjensidige NOR Kapitalforvaltning). Merger was a part of Gjensidige NOR and DnB group merger process.	Avanse Norge (I) Avanse Norge (II)

Table 8-14 shows the results for the performance measure estimates before and after acquisitions

	M^2 before	M^2 after	Adj. Jensen Alpha before	Adj. Jensen Alpha after
ODIN Norge	-0,0021	0,0050	-0,0015	0,0050
GAMBAK	-0,0028	-0,0045	-0,0039	-0,0011
Alfred Berg Aktiv (II)	0,0011	-0,0059	0,0005	-0,0039
Delphi Norge	0,0069	-0,0008	0,0070	0,0007
Delphi Vekst	0,0077	-0,0031	0,0081	-0,0021
Alfred Berg Aktiv	-0,0011	-0,0029	-0,0007	-0,0040
Alfred Berg Norge	-0,0020	-0,0002	-0,0020	-0,0004
Alfred Berg Norge +	-0,0011	0,0001	-0,0010	-0,0001
Avanse Norge (I)	-0,0022	-0,0002	-0,0023	0,0000
Avanse Norge (II)	-0,0033	0,0009	-0,0034	0,0012

Table 8-14 Performance Before and After Acquisition

The results are varying from one company to another, and do not give us a clear-cut answer.

For Avanse Forvaltning both portfolio performance measures improved for both funds in our sample. This result does not surprise us as Avanse Forvaltning had troubles with its performance while the company was undergoing closer integration process with Gjensideige NOR Kapitalforvaltning and its CEO Arnfinn Kirkenes resigned at the end of 2002. In this case reshuffling cards saved the long-standing brand name, and improved the portfolio performances.

When it comes to acquisitions of stand-alone asset management companies bought by larger financial groups, we find that two companies did improve their results while the performance of other two deteriorated.

Funds of Delphi Fondsforvaltning and Gambak Fondsforvaltning performed worse after acquisition. Both funds of Delphi Fondsforvaltning performed worse according to all measures after being bought by Storebrand group. Similar results are also observed for Gambak Fondsforvaltning. According to Jensens alpha GAMBAK fund did perform

slightly better after acquisition while it became a worse investment alternative for non-diversified clients as suggested by declining M^2.
Acquisitions of Odin Forvaltning and Industrifinans Fondsforvaltning in 2000 were successful strategies in terms of improved performance. The only exception here is the fund Alfred Berg Aktiv, which performed worse after acquisition.

It is not unusual that after an acquisition or merger, companies merge their funds keeping the best track record or the best brand name and image. Some of the Industrifinans Fondsforvaltnings funds were merged with Alfred Berg Fondsforvaltning and Oslo Fondsforvaltning funds in 2001 after ABN AMRO acquired them. The same happened in merger where Avanse Forvaltning participated. This factor plays a role for our results as the rates of returns of the funds we are analyzing might be biased.

However, we observe the following patterns in our sample; changes in ownership do have an influence on the companies' performance, and it seems to have the same effect (positive or negative) on all the acquired company's funds.

8.7 Big vs Small Managers

In this subsection we are going to investigate whether bigger management companies do better than smaller companies when it comes to performance of Norwegian equity funds. We divided 12 asset management companies present in our sample into 2 groups, namely "Big Managers" and "Small Managers". We define "Big Managers" as a company whose assets under management exceed 15 billion NOK, the rest of the companies fall under category "Small Managers".

Afterwards we use the fund performance measurements to assign each of the fund points, ranging from min 3 points and max 108 points. The points are calculated as follows: we rank funds from 1 to 36 according to Sharpe, Treynor measure and appraisal ratio and then sum all the 3 ranking's for each of the fund. So the best fund could theoretically get 3 (1+1+1) points if it was the best according to all three measurements while 108 (36+36+36) would be a point sum if the fund came out worst in all performance measurements, none of our funds received the highest or lowest possible point sum.

Table 8-15 exhibits the average sum of points each management company got for their funds. Table also indicates sum of points for the best and the worst fund of the specific management company as well as information of how many funds of a company are contained in our sample and how much assets they have under management.

	Number of Funds	Points Worst Fund	Points Best Fund	Points on Average	NOK billion Under Management
Big Managers					
DnB NOR Kapitalforvaltning	7	102	20	65	104,5
Storebrand Kapitalforvaltning	6	93	4	42	41
Alfred Berg Kapitalforvaltning	5	89	7	35	23,5
Nordea Fondene Norge	5	102	53	73	27
ODIN Forvalting	1			13	38
Average of the group:				**45,6**	
Small Managers					
Handelsbanken Fondforvaltning	1			73	3
Fondsforvaltning	3	85	50	60	2
Kaupthing Forvaltning	1			28	0,07
WarrenWicklund Fondsforvaltning	1			93	2
Carnegie Kapitalforvaltning	2	68	12	40	9,5
Danske Capital Norge	3	94	45	70	6
Orkla Finans Forvaltning	1			74	2
Average of the group:				**62,6**	

Table 8-15

On average Big Managers did better than Small Managers in time period 1998-2008. However the best and the worst performing fund is to be found in the Big Manager group. The gap is quite wide at 17 points, that means roughly 8 (17/3) places ranking difference between Big and Small Managers funds on average. It can also be explained as Big Managers' funds performing better than 60 % of the market on average while Small Managers' funds do better than just 40% of the funds in sample (100% - 46/108x100 ≈ 60 % and 100%-63/108x100 ≈ 40%).

We restrain ourselves from generalizing these results to other periods and other sectors since in the Small Manager group we have just 12 funds while Big Managers group has 24 funds.

It is worth noting that many funds have changed their owners, thus it could be possible that Big Managers have bought up smaller companies with good results. The other factor we would like to draw attention to is that bigger companies have more resources for in house analysis. They can afford more and better analysts that can specialize in narrower geographical markets or industries than a smaller company. The same goes for fund managers. These aspects could be part of explanation why bigger managers did on average better than smaller ones.

Our two stand-alone companies Fondsforvaltning and Warren Wicklund did quite badly by getting 60 and 93 points, meaning that they have performed worse than market/sample average.

9 Conclusions

Based on the results from the empirical analysis, we shortly summarize our main findings.

First, we look at results we arrived at by evaluating equity funds based on portfolio performance measures.

All of the funds in this analysis achieved a positive monthly average excess return above the risk free rate, but there are only 18 funds which had outperformed the market index OSEFX based on the Sharpe and the Treynor ratio. There were no negative Sharpe ratio, which indicate that these funds have done better than the interest rate market during the period analyzed. Ranking of the funds on the basis of the Jensen's alpha shows that17 of the funds have a negative alpha, they do therefore not have the ability to generate risk adjusted excess return over the risk free rate. It is noteworthy that no α values are significantly different from 0, implying that we could not reject the null hypothesis of 0 abnormal returns. It seems to be that these funds do not generate returns over a normal compensation for risk, since non of the alpha values in this analysis are not significantly different from zero.

There were 14 funds that had betas significantly different from one in our analysis. Many funds did not have the same risk profile as they claim. There are 17 funds claiming to have higher risk than the market, despite the fact that the beta values of these funds are lower than the market. We observed also that individual funds within the same management company have a remarkable similar risk profile measured by beta values. The coefficient of determination (R^2) is high in our sample. Hence, for nearly all of the funds systematic risk is the main element of total risk .

The funds with the best performance according to the majority of the performance measures were Alfred Berg GAMBAK, ODIN Norge and Storebrand Verdi. The funds ranked poorest were the following: Alfred Berg Aktiv, Nordea Vekst and Storebrand Vekst. Hence, the performance measures show a high positive correlation to each other.

We find no performance persistence in Norwegian equity funds' returns during the period 1998-2007. However, we observe statistically insignificant reverse pattern over the period, meaning that funds that do good one year have higher than 50% chances of doing bad the next year. These results are strongly exposed to the bias in our data sample since we are looking only at funds that have been in existence during the *whole* observation period,

leaving out funds that were started after 1998 and those that ceased to exist before March 2008.

Market timing ability for Norwegian equity funds is rare. Only one fund out of 36 exhibited significant positive market timing ability by both tests that were employed to test for stock picking and market timing abilities. We find that the results are extremely sensitive to chosen benchmark. However we conclude that Efficient Market Hypothesis holds for Norwegian stock markets.

We find that Norwegian equity funds of companies whose assets under management exceed 15 bn NOK performed better than 60% of the market on average, while funds of companies who manage assets worth less than 15 bn NOK averagely did better than 40% of market in our observation period.

For the five acquisition and merger cases we examined we find the following trend: changes in ownership do have an influence on the companies' performance, and it seems to have the same effect (positive or negative) on all the acquired company's funds. However, we do not find any evidence that independent stand-alone companies show inclination to performance deterioration after being bought by big financial groups. We find that two companies did improve their results while the performance of other two deteriorated after acquisition.

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