Active Management Across Business Cycles: Time-varying performance analysis of Norwegian mutual funds

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1.0 Introduction

The purpose of our study is firstly to investigate whether some actively managed mutual funds in Norway are able to earn abnormal returns, i.e. earn returns net of costs that are in excess of the returns expected by the financial theory. If so, is the performance due to fund managers managerial skill, or luck? We will define managerial skill in the same way as Kacperczyk et al. (2014); "as a general cognitive ability to either pick stocks or time the market at different times". Secondly, we will investigate whether the recorded performance persist, and if so, for how long performance persist. Lastly, we will take the time variability into account and investigate whether performance also persist during times of recessions, when it matters the most for investors, and in expansions. An important question to answer is whether mutual funds are able to earn excess returns net of fees for their investors during economic downturns, when "investors' marginal utility of wealth is high" (Kosowski, 2011).

Mutual fund performance has been extensively examined, and been the source of an academic debate throughout the years. One of the important questions is whether the actively managed funds outperform the passive funds, that tracks the market portfolio, consequentially giving rise to the question on whether they can justify the extra costs carried by their investors.

According to the efficient markets hypothesis, on average, the pursuit to beat the market should be a zero sum game, as current prices reflect all available information; hence outperforming the market would be a matter of luck, or chance, rather than skill. The efficient markets and much of the prevailing financial theory does not support the idea that actively managed funds possess the skills necessary to outperform the market. Persistence in the performance by mutual funds provides us with information on whether the fund managers really possess these skills or not, but previous literature is inconsistent and the findings diverge. Persistence in performance has important implications from both an academic- and practical orientation, as it either confirms or denies the prevailing financial theory, and concerns whether active funds add cost adjusted value to their investors.

Fama and French (2010) found that if there were any fund managers that possessed the skills to outperform the market, their tracks would not be seen due to the inferior

performance of the fund managers that possessed insufficient skills. This supports the arguments of Sharpe (1991) that actively managed funds on average would not outperform the passively managed funds, in favour of the efficient markets hypothesis.

Shiller (1981) spiked the fire in the academic debate when he found that markets were too volatile than what could be reflected by the fundamentals – the financial theory. Marsh and Merton (1986) dismissed Shiller's findings on methodological grounds, defending the position of the financial theory. The contradictory results in academic literature even manifested themselves in the actions of Nobel Prize winner Robert Merton. He was later a co-founding partner in several actively managed hedge funds, seeking to take advantage of the same market inefficiencies that, according to his own arguments, did not exist. The Long-Term Capital Management hedge fund that he co-founded, later went bust and blew up under what was called a black swan event according to Taleb (2007, p. 62).

The discrepancy in the research of persistence in performance has yet to be laid to rest. Kacperczyk et al. (2014) found evidence for fund manager skills in their research on time-varying mutual fund performance, and hence found evidence of outperformance. Sharpe (1991) on the other hand argues that if any empirical analysis find evidence of outperformance by actively managed funds, it is "guilty of improper measurement" (Sharpe, 1991), similar to the arguments of Marsh and Merton (1986) against Shiller (1981).

Based on previous research, we take what we assess to be the conservative approach, in favor of the efficient market hypothesis with regard to our initial hypothesis:

Actively managed mutual funds do not hold the relevant skills to outperform the market, neither in times of recessions nor in expansions.

2.0 Theory and literature review

Section 2.1 first presents classical performance evaluation measures that compare return relative to a benchmark as well as the studies associated with them. Section 2.2 expands the research by looking at more complex models that account for market timing and stock selectivity. In addition, it presents the studies on performance persistence among the funds. Section 2.3. introduces performance measures that vary with the changing economic conditions. Finally, section 2.4 presents the research on the fund performance from Norway.

2.1 Mutual fund performance evaluation

Building on Markowitz' (1952) portfolio theory, Sharpe (1964), Treynor (1962), Lintner (1965) and Mossin (1966) derived the Capital Asset Pricing Model (CAPM) that determines a linear relationship between a security's systematic risk and expected return.

Jensen's alpha is one of the most general and widely used tools for evaluating fund managers' performance, and is one of the first extensions to CAPM made by Jensen (1968). Jensen (1968) found that mutual funds were on average unable to generate excess returns net of expenses. One major drawback of this model is the fact that, alike CAPM, it assumes the existence of the market portfolio, which is problematic to find in the real world. In contrast to Jensen's results, Ippolito (1989) who also utilized Jensen's alpha as performance measure, found that actively managed US mutual funds outperformed the passive benchmarks net of the charged fees. Elton et al. (1993) found that the results of Ippolito (1989) were misrepresentative due to the wrong choice of the benchmark. After utilizing the correct benchmark, the authors found Jensen's alpha to be negative.

The widely used market proxies such as S&P 500 Index do not represent the true composition of the market portfolio as they exclude many of the risky assets, e.g. a variety of domestic and foreign stocks and bonds, real estate etc. (Reilly and Brown, 2011) This issue is referred to as a benchmark error, which was highlighted by Roll (1977) in his critique of the CAPM model.

Several other studies underscore the importance of using the appropriate benchmark when evaluating performance. Lehmann and Modest (1987) concluded in their performance analysis of 130 US mutual funds that performance measures such as

Jensen's alpha are highly sensitive to the chosen benchmark. Malkiel (1995) investigated performance of US mutual funds in the 1971-1991 period and concluded that on average mutual funds tended to underperformed relative to the market. However, the author demonstrated that the choice of benchmark was significantly influencing the results. This eventually led to the emergence of more complex models that sought to provide a better explanation of security returns.

In an attempt to extend the model of Jensen (1968), Fama and French (1993) proposed a Three Factor Model. The authors found that small-cap stocks outperformed the large-cap stocks and that value stocks outperformed the growth stocks. Consequently, in addition to market risk, Fama and French included two more factors that improve the explanatory power of the model, namely SMB (Small Minus Big) and HML (High Minus Low). The authors suggest that the Three Factor Model explains over 90% of the portfolio returns. Fama and French later expanded their model into a Five Factor model in 2015, including a profitability- and an investment pattern factors, arguing that the HML factor becomes redundant after accounting for the new factors. Including more variables in the model might also reduce the risk of artificially inflating the alpha value due to omitted variable bias.

Carhart (1997) extended the original model of Fama and French (1993) by accounting for the momentum effect, which was first documented by Jegadeesh and Titman (1993). The model became known as a Four Factor Model, where the additional one-year momentum factor measures the excess return of buying last year's winners and selling last year's losers. Carhart examined US mutual funds over the 1962-1993 period and found no support for the existence of managerial skill. He attributed excess returns of mutual funds to luck rather than the ability of employing momentum strategies. The author concludes that excess returns of some individual funds that do appear to follow momentum strategies are offset by the investment expenses.

Thus far, the research presented above is leaning towards underperformance of mutual funds, on average; and nonexistence of managerial skill, although it has not been able to fully answer this question. Nevertheless, the underperformance cannot explain the recent growth of actively managed mutual funds. Gruber (1996) and Zheng (1999) attempted to explain this puzzle by indicating that mutual fund

investors can in fact pick superior funds to invest into. This raises the question of whether more extensive research and complex models can perhaps measure the managerial skill.

2.2 Market timing, selectivity and persistence

Traditionally, a manager's stock selection and market timing abilities are evaluated separately. Stock selection refers to the ability to pick the stocks that a manager considers "undervalued" at the current market prices. Such stocks might therefore offer profit at some future point of time. Market timing refers to the ability of switching between the two asset classes, namely stocks and bonds, depending on the manager's belief about their performance in the near future. One of the first models to account for market timing and stock selection measures was proposed by Treynor and Mazuy (1966). Their findings suggest that the excess return that certain funds are able to generate comes from the fund managers' capability of selecting underpriced stocks rather than timing the turns on the market. However, their model is based on Jensen's alpha meaning that it suffers from the same limitations as the CAPM model. Similarly, Daniel et al. (1997) tested for stock selection and market timing abilities among fund managers and found that some funds showed stock picking abilities, while market timing ability was not confirmed. However, this outperformance was very close to the charged fees and therefore not much value was generated for the investors. On the contrary, Edelen (1999) documented that mutual funds underperform on average, but attributed it to the liquidity service that fund managers provide to investors rather than the lack of managerial skill. One of the recent studies on selectivity and market timing was carried out by Kacperczyk et al. (2014) who used unique methods for capturing fund manager skill. They found both market timing and stock selection abilities among fund managers and most importantly concluded that those managers who exhibit stock picking abilities are also able to time the market well.

Several other studies have documented that a number of actively managed funds are capable of generating abnormal returns (Gruber, 1996; Wermers, 2000). Despite the extensive research on the topic, it remains unclear if the ability to beat the market can simply be attributed to luck or if the fund managers indeed have market timing and stock selection skills. One way to differentiate between luck and skill is

to examine whether superior performance of active funds persists over time. Performance persistence of mutual funds has been the subject of much empirical research as an attempt to study whether active management in fact pays off.

One of the early studies on performance persistence of mutual funds was done by Sharpe (1966) who ranked mutual funds in terms of their Sharpe ratios over the periods 1944-1953 and 1954-1963. He found a significant positive correlation between the two periods and concluded that mutual fund performance persistence might exist. Carlson (1970) examined equity mutual funds over the period of 1948-1967. The author found partial persistence within 5 years of fund returns, but no persistence over a longer period of 10 years. In the later studies, Grinblatt and Titman (1992) investigated 279 US equity funds in the 1975-1984 period using 8 portfolio benchmarks. Their evaluation periods consisted of 5 years and the authors found evidence of persistence for the following 5-year period. Building on their previous work Grinblatt and Titman (1993) studied CRSP listed quarterly holdings of mutual fund portfolios and found performance persistence. The authors demonstrated that funds that showed superior performance in the first half of the sample period were the ones that performed well in the second half, suggesting that superior performance could be predicted to some extent. Further studies also found that performance persists in the short run and that past performance could be an indicator of the future performance. (Goetzmann and Ibbotson, 1994; Brown and Goetzmann, 1995; Elton et al., 1996) However, as outlined by Malkiel (1995), the early studies might suffer from the survivorship bias which should be taken into account.

Hendricks et al. (1993) studied quarterly returns of 165 survivorship bias-free US equity funds over the 1974-1988 period and found short-term persistence (up to one year) driven by the “hot hands” phenomenon. This indicates that funds that outperformed the market in the past four quarters also performed well in the next four quarters. Furthermore, the authors showed that funds that performed poorly continued to be inferior in the following period, which is also known as the “icy hands” performance persistence. On the contrary, Carhart (1997) and Wermers (1997) argued that the “hot hands” result is explained by the one-year momentum effect of Jegadeesh and Titman (1993). Specifically, Wermers (1997) found that

mutual funds actively practice momentum investment strategies and concluded that no persistence remained after controlling for the momentum effect.

Most of the previous studies focused on exploring long-term performance persistence in mutual funds and documented different results. One potential explanation for this might be the use of different methodologies[1]. Bollen and Busse (2005) examined 230 US mutual funds over the 1985-1995 period using daily data and concluded that superior performance persistence exists, but is a short-lived phenomenon. Interestingly, when the authors adjusted their methodology to the one used by Carhart (1997) they found that performance persistence disappeared.

Kosowski et al. (2006) applied a bootstrap procedure to evaluate the performance of US mutual funds between the 1975 and 2002 period. The authors found evidence of superior performance net of fees and persistence among growth-oriented funds, which they concluded could not be explained solely by sampling variability, i.e. luck. Kosowski et al. (2006) also highlighted the importance of using the bootstrap approach when ranking mutual funds in order to eliminate the ex post sort problems. Similarly, Huij and Verbeek (2007) utilized an empirical Bayesian approach and found short-term performance persistence among top funds with the use of monthly data. In contrast, Cuthbertson et al. (2008) in an attempt to distinguish between skill and luck for UK mutual funds found little evidence of stock-picking abilities and attributed abnormal returns of the funds to "good luck". The authors found no persistence among past-winner funds, while past-loser funds appeared to persist.

Although several studies have shown that active mutual funds can indeed deliver returns to their investors, it might not be the only explanation to why investors favor active management. Another explanation might be that the actively managed mutual funds provide better returns when investors need them the most, i.e. during the times of economic downturns. The next section takes a deeper look at the mutual fund performance over the business cycles.

[1] Specifically, these studies differ with respect to the time horizons, ranking measures and evaluation measures used.

2.3 Time-varying performance measures

The classical performance measures (Jensen 1968; Fama and French 1993; Carhart 1997) are "unconditional" in the sense that they assume the risk exposures to be constant over the evaluation period. In other words, such performance measures disregard the variations in the state of the economy. However, since the real world (unlike the hypothetical) is very dynamic and fund managers have the ability to rebalance portfolios, the classical approaches to measure performance are likely to be unreliable. Conversely, conditional performance evaluation allows risk exposures to vary in response to variables related to the state of the economy. One of the early studies that incorporated a time-varying beta based on the market conditions was performed by Henriksson and Merton (1981). Nevertheless, their model was simplified and suffered from many of the same limitations as the CAPM model. Ferson and Schadt (1996) argued that fund managers who incorporate public information in their portfolio strategies should receive no credit for superior performance. Hence, they proposed evaluation measures that are consistent with semi-strong form of market efficiency of Fama (1970). Ferson and Schadt (1996) modified Jensen's alpha and two market timing models of Treynor and Mazuy (1966) and Henriksson and Merton (1981) to allow the risk exposures and the market premiums to be "conditioned," i.e. vary over time with the state of the economy that are measured by public information variables. Using the conditional model, the authors examined 67 mutual funds over the 1968-1990 period and found that the risk exposures change in response to public information. Their results demonstrated that while traditional performance measures such as Jensen's alpha usually show negative average performance of funds, using conditional models the distribution of alpha shifts to the right and is centered around zero. The authors concluded that conditioning information on the state of the economy is both statistically and economically significant. Christopherson et al. (1998) extended the model of Ferson and Schadt (1996) to allow for a time-varying conditional alphas in addition to betas. Their results show that time-varying alphas and betas have a better predictive power about future performance than the unconditional measures.

Further studies attempted to explore not only time-variation in alphas and betas, but also how they relate to different business cycles. Moskowitz (2000) and Glode (2011) suggested that mutual funds might add value by performing well when it matters the most to investors. Moskowitz (2000) examined performance of mutual

funds over expansion and recession periods as determined by NBER and found that active mutual funds generated an additional 6% per year during recession periods when return on the market was in fact -1.5% per month. The author concluded that using unconditional performance measures when evaluating performance might understate the managers' skills. Ferson and Qian (2006) studied US mutual funds over the 1973-2000 period allowing for time variation in conditional timing ability of the fund managers. They found that the funds are better able to time the market when the slope of the term structure is steep and short-term corporate debt and stock markets are relatively liquid.

More recent studies expand the research on the time-varying performance of the fund managers by addressing some issues associated with previous models. Mamaysky et al. (2008) found that when using conditional models, the macroeconomic factors do not have sufficient explanatory power to forecast factor loadings for the majority of funds. Hence, the authors employed a Kalman filter model to address this issue. Kosowski (2011) applied a regime switching model to study risk-adjusted performance measures and the correlation structures of the US mutual funds during expansion and recession periods from 1962 to 2005. The author found evidence of underperformance among funds during the periods of economic expansions, while in recession the funds were able to generate excess returns above the benchmarks. Kacperczyk et al. (2014) studied fund manager skills separately in booms and recessions and found that some fund managers are able to optimally switch between the two investment strategies depending on the state of the economy. The authors showed that stock-picking abilities are stronger in expansion periods, while market timing is stronger in recessions. Moreover, their results implied that the same funds that showed superior performance in expansions, were also able to time the market well in recessions. This finding indicates that skilled fund managers are capable to allocate attention during varying economic states.

2.4 Norwegian studies

Most studies on mutual fund performance is done in the US, and the existing literature on fund performance in Norway is highly limited. Gjerde and Sættem (1991) is the first ones to study Norwegian mutual fund performance, to our

knowledge. Using a sample of 14 Norwegian mutual funds during the period of 1982-1990, they found outperformance in the period of 1982-1984, and that managers possessed market timing abilities. However, they found no evidence of managerial stock picking abilities.

Sørensen (2009) used a survivorship bias free sample when investigating the performance and persistence of Norwegian mutual funds. By employing the bootstrap simulation method proposed by Fama and French (2010), he found no evidence of persistence in performance.

Contradictory to the results of Sørensen, Gallefoss et al. (2015) finds opposite results using daily data, in contrast to a sample of monthly data as used by the two previously mentioned studies on Norwegian funds. Gallefoss et al (2015) is, to our knowledge, the first study outside of the US that use daily data, they find evidence of managerial skill, where top performers are better at both stock picking and market timing than bottom performers, and the performance persists for short time horizons of up to one year.

3.0 Data

3.1 Mutual Fund data

We have not been able to gather the data for our sample yet, but we will collect data on the returns of the Norwegian mutual funds, as well as other relevant variables for our analysis. The returns of the mutual funds will be calculated by using the net asset values (NAV), which is the funds price per share (Morningstar.no), $NAV = \frac{total\ net\ assets}{shares\ outstanding}$.

We will collect data on daily NAV, as Gallefoss et al (2015) highlighted the importance of using daily data to evaluate the persistence in performance, as they found that performance persistence was only short-term. Fund returns will be calculated as: $r_{t,t-1} = \frac{NAV_t}{NAV_{t-1}} - 1$

Possible sources to collect data on NAV is Morningstar, the CRSP database or Oslo Børs, who collect daily and monthly returns from the mutual funds, or other possible sources.

The sample will focus on Norwegian equity funds because we want to exclude funds that invest less than 80% in Norwegian equities, we will also include liquidated funds in order to avoid survivorship bias.

3.2 Benchmark

We will focus on the Oslo Børs Mutual Fund Index (OSEFX) as a benchmark for our analysis. This is because the Norwegian mutual equity funds is required by law to invest in at least 16 different stocks, where the weight of each company cannot exceed 10%, OSEFX reflects these requirements, and hence we judge this index to be the most suitable for our analysis.

3.3 Other variables

In addition to data on the return and benchmark, we will collect data to assess each fund's performance with regard to classical asset pricing models such as the capital asset pricing model (CAPM) and Fama and French's 3-factor model, as well as Carhart's 4-factor model. We will collect the three month and twelve month Norwegian Treasury bill rates as a proxy for the risk free rate. The remaining factor returns will be collected from Bernt Arne Ødegaard's web page, who has made these factors on the Norwegian market available. However, there might be some discrepancy between the pre-2010 and post-2010; hence, we are open to use other sources to collect the factor returns data.

Following the Kacperczyk (2014) methodology, we also need to collect data on the respective fund's size (measured as total net assets), age, expense ratios, turnover, load, name of manager, market capitalization, and book to market ratios, as well as the momentum factor from Carhart's model mentioned above.

4.0 Methodology

We will start our research by investigating whether fund managers are actually able to beat the market, i.e. over-perform and earn abnormal returns. This will be done by running time-series regressions with different factor models, as well as performing a bootstrap method adapted from Kosowski et al (2006) and Fama and

French (2010). The latter method is to verify the results significance and to separate skills and luck, as proposed by Sørensen (2009).

To further investigate the relationship between fund manager skill and luck, we will follow the methodology of Kacperczyk (2014). In accordance to Kacperczyk (2014), we will define fund manager skill as either "the ability to pick stocks" or "the ability to time the market at different times" (Kacperczyk, 2014). Fund managers might not necessarily possess both managerial abilities, and these abilities might change during the business cycles.

4.1 Factor Models

In this subsection, we will establish which of the various factor models we will be using to evaluate the performance of Norwegian mutual funds. Whether a fund over- or underperforms will be determined by the respective fund's alphas, and whether they are positive or negative and statistically significant.

4.1.1 Jensens's alpha

One of the cornerstones in today's finance is the CAPM, developed by Sharpe (1964), Treynor (1962), Lintner (1965) and Mossin (1966). Jensen (1968) proposed an extension to the CAPM, where he regressed the return of fund *i* net of the risk free rate, upon the single factor of the market return exceeding the risk free rate, as presented below;

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,m}\left(R_{m,t} - R_{f,t}\right) + \varepsilon_{i,t}$$

Where $R_{i,t}$ represents the expected return of fund *i* at time *t*, $R_{f,t}$ is the risk free rate, $R_{m,t}$ represents the market return and $\beta_{i,m}$ is the markets systematic risk factor, where $\varepsilon_{i,t}$ is the unsystematic, idiosyncratic, risk which is assumed to be diversified away towards zero. According to Jensen (1968), a fund's performance is measured by a significant non-zero alpha. A significantly positive alpha would represent abnormal performance, in favour of fund manager skill, and vice versa for a significantly negative alpha.

4.1.2 Carhart's alpha

As we have mentioned previously, at least some of the assumptions that CAPM relies on are unrealistic in the real world. Jensen's simple extension of the model was later expanded into multifactor models, in order to account for various

anomalies observed in the market that could predict deviations from the expected returns consistent with the CAPM.

Fama and French (1993) added two additional variables to Jensen's single factor model: HML and SMB, which is the factor of high minus low book-to-market ratio (HML), and small minus big (SMB). These factors account for the size- and the book-to-market anomalies, which have been observed to be good return predictors, but are inconsistent with the return levels of the CAPM.

Carhart's (1997) four factor model is a further extension of Fama and French's three factor model. He introduced one additional factor that captured the momentum anomaly, that good- or bad performance continued the following periods. Carharts four factor model is specified below:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,m}\left(R_{m,t} - R_{f,t}\right) + \beta_{i,SMB}SMB + \beta_{i,HML}HML + \beta_{i,WML}WML_t + \varepsilon_{i,t}$$

Where the first part of the model is the same as for Jensen's alpha, the SMB and HML factors are the contributions from Fama and French (1993) for the size- and book-to-market returns, while the WML (winners minus losers) is Carhart's additional factor that accounts for the momentum. The alpha-interpretation is the same as for Jensen's alpha, as a predictor of fund performance when the alpha is statistically significant and different from zero.

Including these factors have increased the models explanatory power on the fund's returns, as well as reducing the weakness of ascribing skill to fund managers where there is none, due to omitted variables. Since we want to investigate fund performance and fund manager skill during the business cycles, we want to account for some of the known anomalies in the market, and therefore see Carhart's four factor model a good fit for our investigation.

4.2 Luck vs. Skill

We will further investigate whether fund performance is due to managerial skill or luck by applying a bootstrapping technique. If we find that fund performance might in fact be due to managerial skill, we will separate managerial skill into market timing ability and stock picking ability in accordance with Kacperczyk (2014).

4.2.1 Bootstrapping

To avoid the problem that inferior fund managers outbalance the managers who possess the skills to outperform the market, we will apply the bootstrapping technique in order to distinguish between skill and luck. The bootstrap simulations does not rely on assumptions of normality, in contrast to the conventional OLS approach. Hence, by employing the bootstrap simulations we avoid the problem of rejecting the OLS assumption of normality, as many of the alphas of the mutual funds will probably exhibit non-normal distributions similar to the findings of Kosowski et al (2006).

We will employ the modifications made by Fama and French (2010) to Kosowski et al's (2006) bootstrap method, meaning that instead of running simulations on each fund independently, we will *jointly sample both fund and explanatory returns*, as done by Sørensen (2009) and Gallefoss et al (2015).

4.2.2 Market timing

By market timing ability, we mean that some skilled investors might have the ability to anticipate the direction of the market movements. In that way, they are able shift funds between the market portfolio and other assets, and earn excess returns. We will evaluate market timing ability by using the framework proposed by Kacperczyk et al (2014), however the approach suggested by Treynor and Mazuy (1966) or Henriksson and Merton (1981) might also be applicable.

$$Timing_{j,t} = \Sigma_{\mathrm{i}=1}^{n}(w_{i,t}^{j} - w_{i,t}^{m})(\beta_{i,t}R_{t+1}^{m})$$

Timing is measured by how the weights of the fund's assets co-move with the return of asset *i's* systematic component ($\beta_{i,t}R_{t+1}^{m}$), where *w* is the fraction of asset *i* in the beginning time *t* for either fund *j* ($w_{i,t}^{j}$) or the market ($w_{i,t}^{m}$). R_{t+1}^{m} is the realized return between period t and t+1.

Kacperczyk (2014) operates with monthly frequency, and dependent on whether we are able to collect daily data for performing these analysis, we will also measure timing and stock picking at a monthly basis. However, since we are collecting daily data for our other analysis, the approach suggested by Treynor and Mazuy (1966) or Henriksson and Merton (1981) might also be a good fit for evaluating market timing ability. Daily data will also be especially convenient for

two latter approaches, as market exposure decisions are most likely made more frequent than what we can capture by looking at monthly data.

4.2.3 Stock picking

Similarly to market timing ability, stock picking abilities refer to the ability of anticipating the movements of the individual stocks, and hold the specific stocks in periods where the respective stock's return is high.

$$Picking_t^j = \Sigma_{i=1}^{n}(w_{i,t}^j - w_{i,t}^m)(R_{t+1}^i - \beta_{i,t}R_{t+1}^m)$$

Where $Picking_t^j$ measures how the fund's weights of each stock co-move with the unsystematic component of the stock return (R_{t+1}^i), all other variables being equal to those used in measuring market timing.

By employing this methodology for measuring skill, overall and separated as stock picking and market timing, we hope to capture the time varying managerial abilities, and hence see if the managerial abilities shift during bear- and/ or bull markets.

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