

HOW TO GENERATE ABNORMAL RETURNS.

An evaluation of how two famous trading strategies worked during the last two decades.

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ABSTRACT

We examine whether stocks with small market capitalization have outperformed stocks with large market capitalization and if stocks with high book-to-market equity ratio have outperformed stocks with low book-to-market equity ratio. During the years 1991-1999 stocks with high BE/ME-ratio and small firms performed in line with stocks with low BE/ME-ratio and big firms. However, during the years 2000-2009 stocks with high BE/ME-ratio outperformed firms with low BE/ME-ratio with an average of 8% per year and small firms outperformed big firms with 5% per year.

Keywords: Trading strategies, Fama-French three factor model, Value effect, size effect.

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INTRODUCTION

Do investors who buy stocks with high book-to-market equity ratio (value stocks) outperform investors who buy stocks with low book-to-market equity ratio (growth stocks)? Is it possible to generate abnormal returns by investing in stocks with low market capitalization (small firms) instead of firms with high market capitalization (big firms)?

Two of the most famous strategies, for investors trying to generate abnormal returns, are to invest in value stocks and small firms. Fama and French (1992) explored this relationship. They found that size and book-to-market equity ratio helps capture the cross-sectional variation in average stock returns. We have based our research upon the findings of Fama and French. They examined how securities' returns can be explained by more factors than the market risk premium during the years 1963-1990. Fama and French found a relationship between US securities' excess returns and market return, SMB³ and HML⁴. We have examined this relationship between the years 1991-2009. By examining the new data we can see if what Fama and French found still is true, and if it can be used by investors who want a high expected return in the future.

Previous research has shown that value stocks outperform growth stocks and that small firms outperform big firms (Fama and French, 1992). This information is available to everyone. Investors always try to find strategies that can achieve abnormal positive returns. Therefore rational investors would have invested in value stocks and small firms to achieve greater returns. This would lead to an increase in the price of these stocks and they would therefore not achieve abnormal returns in the future. A different view is that the size and value effect is a premium for a non diversifiable source of risk. Cochrane (1999) reported that the size and book/market premium have diminished substantially during the 1990s. These series of declines after publication suggests that anomalies simply have been overlooked by many investors. As the anomalies are revealed they are exploited until they vanish. However, there are still many mutual funds that focus their investments on value stocks and small firms. Are the fund managers wrong in their investment ideas or is it possible to generate abnormal returns by focusing on value-stocks and small firms? We have not found any publications of this type of study investigating the presence of the size and value effect including data until the end of year 2009. Previous publications in this area have rather

³ The excess return of small firms compared to big firms.

⁴ The excess return of value stocks compared to growth stocks.

concentrated on the validity of the Fama and French three factor model and the drawbacks of using a two pass cross sectional regression method.

We have found that even though the size and book-to-market equity ratio premium disappeared during the years 1991-1999, both small firms and stocks with a high book-to-market equity ratio outperformed big firms and firms with a low book-to-market equity ratio during the years 2000-2009. The results from our two pass cross sectional regression show that the value effect is statistically significant in the years 2000-2009, which implies that the value effect is present sometimes but not always. The size effect is not statistically significant during any of the periods investigated. This indicates that small firms outperformance of big firms, during the years 2000-2009, may be a result of chance. The result that the value effect only is apparent in some periods and that the size effect may be a result of chance makes it hard for investors to make predictions about these strategies future performance.

Our result suggest that investing in value stocks and short selling growth stocks might be a good idea for hedge funds and other active investors during certain time periods. Private persons that are not willing to short sell stocks can possible benefit from allocating more of their assets to value stocks than to growth stocks. It might also be possible to generate abnormal returns from investing in small firms even if this strategy would not have given as good result as the value strategy during the years 1991-2009.

PREVIOUS LITERATURE

In this section we shortly describe the development and in asset pricing research. Asset pricing has been the subject of intense debate and we try to give the reader a good insight in previous findings as well as putting our study in the perspective of others.

ASSET PRICING

Asset pricing research tries to evaluate and understand how investors asses risk and how they determine what risk premium to demand. Asset pricing models provide a method for assessing the riskiness of possible investments by providing an estimate of the relationship between that riskiness and cost of capital. Markowitz (1959) theories of portfolio management provided a framework for asset allocation assuming mean variance preferences. But the model's weakness is that it does not explain how to obtain the expected returns, expected variances and expected covariances needed.

This framework is also cursed with a dimensionality problem when the number of parameters grows large.

THE CAPITAL ASSET PRICING MODEL (CAPM)

The Capital Asset Pricing Model was introduced in the 1960s by William Sharpe (1964), Jack Treynor (1962), John Lintner (1965) and Jan Mossin (1966). The CAPM is an extension of the Markowitz model. The main characteristic of the CAPM is that only one risk should affect the required return and that is the security's co-movement with the market. The risk premium per unit of riskiness is the same across all assets. For an individual security a large part of the risk is firm specific. This risk should not affect the required return since it can be diversified away by holding many securities. The expected return for a security is based upon the return of the risk free asset and the security's beta. A security that moves in the same direction as the market has a positive beta. A security that moves in the opposite direction of the market has a negative beta. The magnitude of co-movement with or against the market determines beta. If beta for an individual security equals one, it is expected to move in the same direction as the market and to the same extent. A security with a beta equal to zero is regarded as having no market risk.

Black, Jensen and Scholes (1972) made one of the earliest empirical studies of CAPM. They estimated betas by regressing historical returns on a proxy for the market portfolio. Their predictions of the slope and the intercept of their regression line are significantly different from the CAPM predictions. One explanation is that there are no true risk-free assets in the world and therefore CAPM should not predict an intercept of zero. Black, Jensen and Scholes (1972) also argue that these differences may be a result of a model specification error, because of the use of a proxy for the market portfolio. They still find that the data are consistent with the prediction of the CAPM.

When testing asset pricing models the main focus is whether the estimated risk premium associated with a given factor is significantly different from zero. Black, Jensen and Scholes (1972) and Fama and McBeth (1973) developed a two-pass regression method that has been widely used to evaluate linear factor pricing models. A version of this method has been used in this thesis which is explained in the methodology section. One drawback of the studies based on this method is that statistical inferences are often made ignoring potential conditional heteroskedasticity or/and autocorrelation in asset returns and factors.

MARKET ANOMALIES

According to the CAPM, expected returns vary across assets because they have different betas. One way of investigating if the CAPM captures all aspects of reality is to test whether other asset-specific characteristics can explain the differences in average return that are not related to differences in beta. Research has shown that the CAPM might not fully capture securities' average returns. Banz (1981) found that the size of the firm help explain its return. This observation has been known as the size effect. Stocks with a low market capitalization achieve higher returns than what the CAPM predicts. Average returns on stocks with high market capitalization are too low compared with what the CAPM predicts. Banz challenged the CAPM by showing that firm size explains variation in average returns better than beta.

Other factors have also been proved to help explain securities' return. Rosenberg, Reid and Lanstein (1985) found that the returns on stocks are positively related to high book-to-market equity ratio. Firms with high book value of equity compared to their market value of equity were found to give higher returns than those firms with low book value of equity compared to their market value. Bhandari (1988) documented a positive relationship between leverage and average return. Leverage may be associated with risk and should thereby be captured by market beta. Despite this, he found that leverage helps explain the cross-section of average stock returns in tests that include firm size and market beta. De Bondt and Thaler (1985) showed that a portfolio of stocks with poor past performance outperformed a portfolio of stocks with good past performance. In contrast to De Bondt and Thaler (1985), Jegadeesh and Titman (1993) showed that stocks that performed well in the past outperformed stocks with poor past performance.

These findings indicate that, for a large collection of stocks, beta has no ability to explain the cross-sectional variation in average return.

FACTOR MODELS

Factor models address some of the problems with CAPM. They rely on a less stringent assumption based on no arbitrage, opposed to the CAPM which relies on an equilibrium argument. Factor models also allow for multiple sources of risk. One of the most famous contributions is the arbitrage pricing theory (APT) by Ross (1976). The APT brought together both statistical and financial arguments in order to develop an asset pricing model. CAPM requires investors to be mean-variance optimizers and relies on equilibrium. The APT does not rely on any assumptions about investor preferences except for the assumption that one investor has non satiable preferences.

Examples of factor models are Chen, Roll and Ross (1986) five factor model and Fama and French (1993) three factor model. Chen, Roll and Ross (1986) used percentage change in industrial production, expected inflation, unanticipated inflation, excess return on long term corporate bonds over long term government bonds and excess return on long term corporate and government bonds over T-bills. Fama and French (1992) found that there still is a negative relation between firm size and return when other variables are included in the regression model. They also found a positive relationship between a firm's book-to-market equity ratio and its stock return. Fama and French (1992) used excess return on a portfolio of small stocks over a portfolio of large stocks and excess return on a portfolio of stocks with a high book-to-market equity ratio over one of with low book-to-market equity ratio. Their tests do not support the prediction that average stock returns are positively related to market beta. They show that for the years 1963-1990, size and book-to-market equity capture the cross-sectional variation in average stock returns. The Fama and French (1992) results has been challenged. Black (1993) and Amihud et al (1992) consider the data to be too noisy to invalidate the CAPM. Kothari, Shanken and Sloan (1995) support this view in their critique against Fama and French (1992), arguing that the results and conclusions are based on how the statistical tests have been interpreted. They say that the estimates of beta have a standard error that is too high to draw any conclusions about the validity of the CAPM. They also state that the Fama and French data procedure has a survivorship bias. By using an alternative data source, the Standard & Poor's industry level data they find that book-to-market equity ratio is only weakly related to average stock returns. The fact that small firms outperformed big firms has also been the subject for debate. Black (1993) suggests that the size effect discovered by Banz (1981) is observed in some periods but not in others, indicating that it is a sample period effect.

The general reaction to the lack of empirical support for the CAPM has been to focus on other asset pricing models. Jagannathan and Wang (1993) have in contrast to this tried to explore whether the weak empirical support may be due to the assumption that a broad stock market index is an adequate proxy for the market portfolio. They improved the proxy for the market portfolio by incorporating growth in labor income, where growth in labor income is a proxy for human capital. When incorporating human capital into the market portfolio they show that the addition makes a significant difference in explaining variation in average returns. In a later publication Jagannathan and Wang (1996) use time-varying betas to account for the business cycle using the corporate bond spread as a proxy. The explanatory power rises substantially and the explanatory power of Fama and French's three factor model disappears.

MARKET EFFICIENCY

The efficient market hypothesis was developed by Eugene Fama as an academic concept. Market efficiency in this concept means that prices are correct and reflect all available information, i.e. there are no arbitrage opportunities, there are quick and correct response (no over- or underreactions) to new information in the market place and investors are rational and use all available information in order to make expectations of future prices. The efficient market hypothesis is divided into three types, strong form, semi-strong form and weak form.

The strong form efficiency states that prices reflect all information, both public and private information. The consequence is that it is impossible to beat the market and that trading on insider information does not generate abnormal returns. In reality insider trading seems to be very profitable.

The semi-strong efficiency states that current prices fully reflect past prices and all public information. According to this hypothesis fund managers are not able to outperform the market and generate abnormal returns. This is challenged by the fact that there are a great number of mutual funds. The Fama and French (1993) three factor model results do also challenge this concept. Empirics supporting the efficient market hypothesis are that fund managers do not consistently outperform the market and new information is quickly incorporated into prices.

The weak form efficiency states that prices reflect all information obtained by examining market transactions. This means that future prices cannot be predicted with the help of past prices. This means that technical analysis will not provide abnormal returns over time. Fundamental analysis in this weak form efficiency may provide abnormal return. Momentum strategies challenge the weak form efficiency.

BEHAVIORAL FINANCE

Behavioural finance investigates whether investors do make systematic errors because of emotional, cognitive and social factors when making decisions. These errors result in market inefficiencies. Behavioral finance argues that some financial phenomena can be understood using models in which some agents are not fully rational. This is built on two building blocks. The first one is the limits of arbitrage. Limits to arbitrage argues that it can be difficult for rational investors to undo mispricing caused by less rational investors because they do not have access to unlimited funds to exploit arbitrage opportunities fully. The second building block is psychology, which is the reason for the kinds of price deviations from full rationality we might expect to see (Barberis and Thaler, 2002).

Behavioral finance often stands accused of data mining for anomalies in an effort to find flaws with the efficient market hypothesis, followed by a search for a behavioral explanation.

THE EFFICIENT MARKET HYPOTHESIS VS BEHAVIORAL FINANCE

De Bondt and Thaler (1985) showed that a portfolio of stocks with poor past performance outperformed a portfolio of stocks with good past performance. This reversal strategy revealed what they considered substantial weak form market inefficiency. There are explanations for why this reversal strategy is successful. The results indicate that markets are overreacting to information. That investor gets overly excited by firms that have performed well in the past and thereby is willing to pay too much (Lakonishok Shleifer and Vishny, 1994). The other explanation is that the over performance of losers and underperformance of winners are related to risk, but standard measures of risk do not support this view. When using the Fama and French (1993) three factor model the reversal strategy profits disappear.

In contrast to De Bondt and Thaler (1985), Jegadeesh and Titman (1993) showed that stocks that performed well in the past outperformed stocks with past poor performance. The momentum strategy indicates that the market is underreacting to information. A challenge to both rational and behavioral approaches is to explain why the results differ.

There is some evidence for a rational explanation. Some of the momentum effect can be explained by tax loss selling to offset gains elsewhere creating a seasonal effect. This will lead to a selling pressure for stocks with poor performance which means that losers will continue to lose enhancing the momentum effect. When beginning a new year these stocks tends to rebound as the selling pressure eases of, weakening the momentum effect (Grinblatt and Moskowitz, 1999). According to Carhart (1997) the momentum strategy is not profitable after accounting for transaction costs. Most of the profits in a momentum strategy comes from short positions in small illiquid stocks characterized with high transaction costs (Grinblatt and Moskowitz, 1999). Fama and French (1993) three factor model with the size and book-to-market equity ratio characteristics describe the major sources of priced variations in all stocks like reversal strategy, leverage and price to earnings strategies. The three factor model is despite high R^2 values unable to explain momentum.

A behavioral approach to explain these anomalies is that they are a result of investors making systematic errors when evaluating public information to make expectations of the future. Barberis, Shleifer and Vishny (1998) used a model built on two updating

biases, conservatism and the law of small numbers. The conservative bias is that investors have the tendency to underweight new information in comparison with prior information. According to conservatism, investors will react insufficiently to a company that announces surprisingly good numbers, pushing the price up a little. Since the price is too low future returns will be higher on average, generating momentum as well as a post earnings announcement effect. The law of small numbers is that investors tend to expect that small samples over short periods of time reflect the properties of the population. If a company produces a series of good earnings announcements investors will overreact pushing the price up too much. The law of small numbers suggests that investors will use this small series of good earnings announcements and make too positive forecasts of the future. The result is that future returns will be too low on average generating long term reversals.

The answer to why stocks with high book-to-market and small stocks are underpriced in some sense is unclear. Fama and French (1993) argue that the value and small firm effects are proxies for a non diversifiable risk factor. The typical stock with a high book-to-market equity ratio has a price driven down due to financial distress (Fama and French, 1996). In the event of a credit crunch, liquidity crunch or flight to quality, stocks that are in financial distress will do very badly. At the same time this is when investors are the least able to cope with losses, resulting in a price premium effect. Heaton and Lucas's (1997) findings, that the typical shareholder is an owner of a private business, reinforce this logic. An investor with a privately owned business is to some extent sensitive to financial events that cause distress for value firms. These types of investors are punished twice if they invest in stocks with high book-to-market equity ratio; through their labor income and through their capital investments. Such a person would demand a premium for holding stocks with a high book-to-market equity ratio (Cochrane, 1999). Lakonishok, Shleifer and Vishny (1994) do not argue against the explanation that the return premium for stocks with high-book-to-market equity ratio to some extent may be due to these reasons. They consider the book-to-market premium to be too big and the covariance with the market to be too low to be considered compensation for systematic risk. They suggest that the high returns are a result of overreactions by investors. They also state that stocks with low book-to-market equity ratio are more glamorous than stocks with high book-to-market equity ratio. Stocks with high book-to-market equity ratio may therefore be neglected by investors and under researched by analysts.

According to Daniel and Titman (1997) the return premiums on small capitalization and high book-to-market stocks do not arise because of the co-movements of these stocks with any apparent factor. They suggest that the high returns associated with the Fama

and French (1993) factors cannot be viewed as a compensation for risk. Daniel and Titman (1997) say that it is the characteristics rather than the covariance structure of returns that appear to explain the cross-sectional variation in stock returns. Firms with high book-to-market ratio tend to have similar characteristics, like being in the same industry or from the same region. Daniel and Titman (1997) also show that high book-to-market stocks covariance with one another was equally strong before they became distressed. Stocks with the same book-to-market equity ratio but different loadings for the book-to-market factor still perform the same average return. Similarly, after controlling for size and book-to-market equity ratio, stocks that have a low market beta has the same expected return as other stocks with a high market beta. When characteristics are taken into account Fama and French (1993), Chen, Roll and Ross (1986) and Jagannathan and Wang (1996) fail to explain the returns of size and book-to-market ratio.

Asness, Moskowitz and Pedersen (2009) provide evidence that momentum and value (investing in securities with high book-to-market equity ratio) strategies are successful for bonds, currencies and commodities as well. They have studied the links between value and momentum strategies universally across asset classes and their connections to global macroeconomic and liquidity risks. They find that value and momentum strategies are positively related across markets and asset classes and that value and momentum are negatively related within and across markets and assets. Their data hints toward a link between value and momentum and liquidity risk but conclude that there is much left to explain.

According to Fama (1998), an efficient market generates categories of events that individually suggest that prices over- and underreact to information. In an efficient market, underreaction will be about as frequent as overreaction. If anomalies are split randomly, they are consistent with market efficiency. He argues that the efficient market hypothesis survives the challenge from literature revealing long term return anomalies. The strongest argument is that most long-term return anomalies tend to disappear with small changes in technique, indicating a methodology problem.

A final concern in previous literature is that anomalies like the size and value effect seem to diminish over time. Banz's (1981) size effect diminished quickly and was declared gone by Black (1993). In Fama and French's initial samples (year 1960-1990), the HML average return is about 2,6 times that of the market (Cochrane, 1999). From year 1990 to year 1999, an investor in the market has increased his or her money one and a half times as much as an HML investor (Cochrane, 1999). These series of declines after publication suggests that anomalies simply have been overlooked by many

investors. As the anomalies are revealed they are exploited until they vanish, in line with the market efficiency hypothesis.

DATA AND METHODOLOGY

DATA

The data used in this thesis are from the Kenneth French's homepage⁵. It includes the three Fama & French factors, market risk premium, SMB and HML, as well as the risk free rate with the one month US Treasury bill as a proxy. The data used are for the period year 1991 to year 2009.

Stocks in the dataset are listed on NYSE, AMEX and NASDAQ. They are divided into five groups depending on the market value of their equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios are defined as the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 size-BE/ME portfolios created. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t and the breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles. These breakpoints will be used to allocate stocks from NYSE, NASDAQ and AMEX to the 25 portfolios. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year $t-1$ divided by market equity for December of $t-1$. The portfolios include all stocks for which we have market equity data for December in year $t-1$ and June of year t and positive book equity data for $t-1$.

The benchmark factors SMB (Small Minus Big, where small is stocks with low market capitalization and big are stocks with high market capitalization) and HML (High- Minus Low book-to-market equity ratio) are constructed from stocks from NYSE, NASDAQ and AMEX. The returns on these portfolios do not include transaction costs. The benchmark portfolios are rebalanced quarterly. The median NYSE market equity is the breakpoint that determines if a firm is small or big. The return of portfolio SML is calculated as the return of the small firm portfolio minus the return of the big firm portfolio.

The stocks on the NYSE are divided into three portfolios depending on their book-to-market equity ratio. The value portfolio consists of the 30% of firms with the highest book-to-market equity ratio. The next 40% of firms are called Neutral. The 30% of firms

⁵ <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html>

with the lowest BE/ME-ratio are called growth firms. The return of portfolio HML is the return of the value-portfolio minus the return on the growth-portfolio.

Book equity is the COMPUSTAT book value of shareholder's equity, plus balance sheet deferred taxes and investment tax credit (if available) minus the book value of preferred stock. Only firms with ordinary common equity (as classified by CRSP) are included in the tests. American depository receipts, real estate investment trusts and units of beneficial interest are excluded.

Rm-Rf, the excess return on the market, is the value-weighted return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month US Treasury bill rate (from Ibbotson Associates).

For a more detailed description of the dataset of the market excess return, the, 25 portfolios, size factor (SMB) and book-to-market equity ratio factor (HML) visit Kenneth French homepage.

METHODOLOGY

The data has been divided into three time periods. The first period is covering the whole time period from year 1991 to year 2009. This first period is then divided into two sub periods. The first sub period covers the years 1991-1999 and the second sub period covers the years 2000-2009. These periods have then been analysed separately.

The programs STATA and Excel are used to analyze the data. We choose to keep only the observations that are relevant to our research. Observations before year 1991 are excluded and only data covering monthly value weighted returns are used.

We summarize statistics individually for HML, SMB and Rm-Rf for the three time periods: year 1991-2009, 1991-1999 and 2000-2009. A new variable, "excess return", is generated by subtracting the one month US Treasury bill rate of return from each portfolio's monthly value weighted return. We run a regression of portfolio excess return upon the market risk premium (Rm-Rf), SMB, and HML for the three time periods. New variables are created to measure the cumulative return for Rm-Rf, SMB and HML for the three time periods. The results of the regressions are exported to tables and graphs. Our main statistical test, the two pass cross sectional regression, is done by using the toolbox xtfmb in STATA.

MAIN STATISTICAL TEST

Stock returns are characterized by large cross sectional samples with strong co-movements. The fundamental sources of these movements are not always obvious

and are not easily measured (Kritzman, 1993). In a statistical system, where a few unobservable sources of system-wide variation affect many random variables, factor models are very useful. It is also preferable to address risk through a limited number of factors. A security's sensitivity to a few common sources of risk may be more stable than its sensitivity to the returns of all other securities in the portfolio. The Fama and French three factor model controls portfolios risk by managing its exposure to a few common sources. By limiting the number of sources of risk, we might be able to control risk better and thereby improve returns.

One aspect of testing the Fama and French three factor model is that the expected returns and betas are unknown. To confront this problem we need to form estimates to use in the empirical test. This requires us to make the assumption that the ex-post distribution from which the returns are drawn are normally distributed, and thereby assume that the excess returns and residual terms are normally distributed. When looking at individual securities to make estimates of beta we will find one part of the estimate that correspond to the population value and some random noise. For individual securities the random noise is generally very large. This is a measurement error. To exemplify this problem think of two securities with the same sample beta. If the measurement error is large their true population betas could be very different from each other. The objectives are to have sufficient dispersion in security betas and to measure this dispersion sufficiently precisely (Jagannathan and McGrattan, 1995). Fama and French (1993) solved this problem by grouping securities in portfolios (based on size and book-to-market equity ratio) which decreases the level of noise.

The method used in this thesis to determining common factors is by using a two pass cross sectional regression. The method has been widely used to evaluate linear factor pricing models. We specify the sources of return covariation, and then try to confirm whether these sources do indeed correspond to difference in return.

The two pass cross sectional regression procedure are used to estimate the parameters in the three factor model. The first step is to run a time series regression of excess portfolio return on excess market return, SMB and HML.

$$R_{it} - R_{ft} = a_i + b_i \times (R_{Mt} - R_{ft}) + s_i \times SMB_t + h_i \times HML_t + e_{it} \quad (1)$$

Where R_{it} is the return on portfolio i at time t , R_{ft} is the return of the risk free asset at time t , a_i is a pricing error, R_{Mt} is the return of the market portfolio at time t , SMB_t is the difference of returns on small and big stocks at time t , HML_t is the difference in

return of high and low book-to-market ratio stocks at time t and e_i is the unexplained component of portfolio i 's return at time t .

After running the time series regressions of excess portfolio return on excess market return a Gibbons, Ross and Shanken test (GRS test) is performed. The GRS test is a statistical test of the hypothesis that the intercepts from the time series equations are equal to zero. It tests of whether the ex-post market portfolio is a mean variance efficient portfolio.

The second step is to in each month run the cross-sectional regression of excess monthly returns on the estimated market beta, and the estimated coefficients for SMB and HML.

$$\bar{R}_{it} - \bar{R}_{ft} = \lambda_0 + \lambda_1 \times \hat{b}_i + \lambda_2 \times \hat{s}_i + \lambda_3 \times \hat{h}_i + e_i \quad (2)$$

Where \bar{R}_{it} is the rate of return of portfolio i at time t , \bar{R}_{ft} is the return of the risk free asset at time t , \hat{b}_i is the estimated beta of the market return from equation (1), \hat{s}_i is the estimated coefficient for SMB in equation (1), \hat{h}_i is the estimated coefficient of HML in equation (1) and e_i is the unexplained component of portfolio i 's return.

RESULTS

The monthly excess return for each of the 25 portfolios can be seen in table 1,2 and 3 and graph 1, 2 and 3. The excess return is calculated as the portfolio return minus the 1-month US Treasury bill rate. The average monthly excess returns for the 25 portfolios are much higher for the period between year 1991-1999 compared to the period between year 2000-2009.

In table 1 we can see that the portfolios of small firms and high book-to-market equity ratio have higher returns than the portfolios consisting of big firms and stocks with low book-to-market equity ratio. In table 4 we can see that the betas for the portfolios with small firms and value stocks⁶ are not higher than the betas for the portfolios with big firms and growth stocks⁷.

The portfolio excess return has been regressed on the market excess return, SMB and HML ($R_{it} - R_{ft} = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$). Table 4, 5, and 6 show the results from the time-series regression for the 25 portfolios. Graph 4, 5 and 6 shows the

⁶A value stock is a stock with high book-to-market equity ratio.

⁷A growth stock is a stock with low book-to-market equity ratio.

relationship between portfolio excess return and the estimated portfolio betas. The graphs do not show a clear relationship between beta and portfolio return. The average monthly excess returns for the 25 portfolios are concentrated to the interval of 0.6 to 1.7% return in the period between the years 1991-1999 compared to the period between the years 2000-2009, where the returns are concentrated to the corresponding interval of -0.4 to 1.2% return. Graph 7, 8 and 9 report the relationship between average monthly excess return and the estimated coefficient for SMB for each portfolio. In graph 9 it can be seen that portfolios with a negative coefficient for SMB have low returns during the years 2000-2009. As the value for the estimated coefficient for SMB increases the dispersion in excess returns increases. Graph 10, 11 and 12 shows the relationship between average monthly excess return and the estimated portfolio coefficient for HML. In graph 12 the plotted portfolios indicate a positive relationship between the estimated portfolio coefficient for HML and average monthly excess return.

Graph 13, 14 and 15 show the average monthly excess return for portfolios organized by size. There is a relationship between firm size and return. Portfolios consisting of larger firms have lower returns during the years 2000-2009 (Graph 15).

Graph 16, 17 and 18 show average monthly excess return for portfolios organized by book-to-market equity ratio. The relationship between book-to-market equity ratio and returns are strong during the years 2000-2009 (Graph 18). The portfolios with high book-to-market equity ratio outperform portfolios with low book-to-market equity ratio.

In graph 19, 20 and 21 we show the outperformance of the market versus the risk free rate, the outperformance of small firms versus big firms and the outperformance of value stocks versus growth stocks. The average annual excess return of the market was 5.5% during the years 1991-2009. The return was 15% a year between year 1991-1999 and -2.5% a year between the years 2000-2009. The years 2000-2009 were good for the SMB portfolio. The SMB portfolio returned 5% annually (Table 9 and Graph 21). During the years 1991-1999 the SMB portfolio returned 0% a year (Table 8 and Graph 20). The average annual SMB return for the years 1991-2009 was 2.5%. The return for HML was strong between the years 2000-2009 with an average return of 8% a year (Graph 21). During the years 1991-1999 there was no HML-effect, the return of the portfolio was -0.5% a year on average (Table 8 and Graph 22).

Fama & French (1996) found an average return of 6% per year for HML. We find that the HML portfolio has performed an average of 4% per year during the period year 1991 until the end of 2009 (Table 7 and Graph 19). We find that most of the 25

portfolios have a positive coefficient for HML (Table 4). The portfolios with the lowest book-to-market equity ratio have a negative coefficient for HML. This is a sign of lower expected returns since HML is positive with 4% a year on average (Table 7 and graph 19).

Of the 25 portfolios, 19 have a positive coefficient for SMB during the years 1991-2009. 5 portfolios consisting of the biggest firms and 1 portfolio with the second biggest firms have a negative coefficient for SMB (Table 4). Since the average return of SMB is about 2.5% a year, this imply greater expected returns for small firms compared to large firms (Table 7 and Graph 19). For the whole period, year 1991-2009, we find that small firms and firms with high book-to-market equity ratio have performed better than what is expected from the CAPM. This might either be due to irrational pricing or due to hidden risks that are not captured by the CAPM.

In general, value-stocks outperform growth stocks and small firms outperform big firms between the years 1991-2009. However, they do not outperform every year. We find that the positive abnormal returns of value-stocks and small stocks only occur during the second period, year 2000-2009. During the first period, value-stocks return approximately the same as growth stocks and small firms perform approximately the same as big firms. We also find that the HML and the SMB portfolio are negatively correlated. For the whole period (year 1991-1999) the correlation is -0.36, for the first period (year 1991-1999) the correlation is -0.32 and for the second period (year 2000-2009) the correlation is -0.40.

It is worth to mention that our results are only valid for the period 1991-2009. We have found that value-stocks and small firms have outperformed growth-stocks and big firms during this period. There are no guaranties for this to happen again in the future. Our results are based upon data from the US-market. It is possible that our findings would have been different if we would have used data from another stock-market.

RESULTS MAIN STATISTICAL TEST

In the two pass cross sectional regression for the years 1991-2009 we find that the risk premium for market risk actually has been negative (Table 10). This is statistically significant. There seems to be a premium for both small firms and firms with high book-to-market equity ratio. However, the values are low and not significantly different from 0 on a 5% significance level. When comparing the calculated returns for the period with the estimated values we find that the coefficient for SMB is predicted to 0.22 (table 10) and the actual value is 0.27 (table 7). For HML the predicted value is 0.40 (table 10) compared to the actual value of 0.38 (table 7) during this time period.

The constant is positive and significantly different than zero indicating a pricing error. This is an indication that the Fama and French three factor model is not very good at explaining portfolio returns. The GRS-test for the portfolios intercept is 3.57 and significantly different from zero for the years 1991-2009 on a 5% significance level.

When running the two pass cross sectional regressions for the years 1991-1999, the risk premium for market risk turns out to be negative again but not statistically different from 0 on a 5% significance level (Table 11). The risk premium for small firms is slightly negative and the risk premium for firms with a high book-to-market equity ratio is slightly positive. None of the values are significantly different from 0 on the 5% significance level. When comparing the calculated returns for the period with the estimated values we find that the coefficient for SMB is predicted to -0.02 (table 10) and the actual value is 0.04 (table 7). For HML the predicted value is 0.02 (table 10) compared to the actual value of 0.00 (table 7) during this time period. For this period the constant is positive and significantly different from zero indicating a pricing error. The GRS-test for the portfolios intercept is 3.01 and significantly different from zero for the years 1991-1999 on a 5% significance level.

We also do the two pass cross sectional regression for the years 2000-2009. The risk premium for market risk is negative again but not significantly different from zero (Table 12). The risk premium for small firms is positive but not significantly different from 0. The risk premium for firms with a high book-to-market equity ratio is 0.76 with a standard error of 0.36. When comparing the calculated returns for the period with the estimated values the coefficient for SMB is predicted to 0.39 (table 12) and the actual value is 0.47 (table 9). For HML the predicted value is 0.76 (table 12) compared to the actual value of 0.72 (table 9) during this time period. This is statistically different from 0 on the 5% significance level. The constant is positive and significantly different from zero indicating a pricing error. The GRS-test for the portfolios intercept is 1.74 and significantly different from zero for the years 1999-2009 on a 5% significance level.

ROBUSTNESS TESTS

The Fama-French (1992) data has been criticized for including a survivorship bias by Kothari, Shanken and Sloan (1995). If our data has been distorted by a survivorship bias this could have an impact on our results.

When testing asset pricing models the main focus is whether the estimated risk premium associated with a given factor is significantly different from zero. One drawback of studies based on a two pass cross sectional regression method is that

statistical inferences are often made ignoring potential conditional heteroskedasticity or/and autocorrelation in asset returns and factors.

Kan and Zhang (1999) criticize the two pass regression method. They argue that as the number of time series observations goes to infinity, the probability of rejecting the null hypothesis that the risk premium of a useless factor equals zero goes to one. Their explanation of this problem is that the true betas of portfolios with respect to a useless factor are zero, which means that the “true” risk premium with respect to the useless factor is undefined. When the estimated betas for a useless factor is close to zero, the absolute value of the estimated risk premium needs to go to infinity to “explain” the cross-sectional difference in expected returns.

When examining whether a trading strategy is providing abnormal returns over time it is common to use some asset pricing model to determine risks and returns. It is also necessary to assume some market efficiency. This creates a problem with joint hypothesis. When performing a hypothesis test and reject the null hypothesis it is unclear whether you reject the asset pricing model, the market efficiency assumptions or both. This may be why market inefficiency’s are so hard to determine and why this area of finance have been the subject of such extensive debate.

IMPLICATIONS AND CONCLUSIONS

Our results imply a negative relationship between excess return and market risk during the years 1991-2009. This means that investors that take greater risk actually get lower returns. Fama and French (1992) also found a negative relationship between excess return and market risk. Their value of the risk premium was not significantly different from zero. Our value is statistically significant. Does this mean that investors have changed their mind and now prefer to take more risk for the same level of expected return? Most likely not. However, our result is important in the way that taking more market risk does not necessarily lead to higher returns. The result can also be regarded as a questioning of market beta as measure of risk.

The coefficient for SMB, λ_2 , is not significant for any of the time periods. Our result suggests that there might be a small SMB premium during certain time periods. Since the SMB premium is very small and the standard error quite high, we can not conclude that there is a SMB premium.

We find that there is a relationship between the returns of HML and portfolio excess return. The value of the HML-coefficient, λ_3 , in the second stage regression is only significant during the years 2000-2009. The value of the HML-coefficient for the whole

period is not significant. Does this mean that book-to-market equity ratio help explain returns or not? Our findings suggest that there is a HML premium during certain time periods. More research is needed to see if our results hold.

Our results from the GRS-tests say that the null hypothesis that a_i is equal to zero is rejected in all the investigated time periods. This indicates that there is some evidence against the efficiency of the three factor model.

Black (1993) suggested that the size effect could simply be a sample period effect. In our results the value effect is observed in the years 2000-2009 but not in the years 1991-1999. Our result may indicate that the value effect also is a sample period effect. This is supported by Rousseau and Rensburg (2004). They found that the increased return from value investing comes from a minority of shares over particular periods. According to the efficient market hypothesis anomalies should be exploited when discovered until they vanish. That an anomaly disappears and reappears is hard to explain. Maybe there is a case for a hidden risk factor that is present some periods but not in others. Fama and French (1993) argue that the value effect is a compensation for risk. They argue that firms with high book-to-market equity ratio are hit harder in bad times like a credit crunch. During the years 2007-2009 the US was hit by a mayor credit crisis, but value stocks have still outperformed growth stocks during the years 2000-2009. One reason for this may be that during the year 1999 the dot-com bubble was in full effect. This resulted in a stock market with relatively high valuations of stocks. The burst of the dot-com bubble in year 2000 hit growth firms to a large extent, which is an explanation for the last decade's poor market performance. This bubble may to some extent explain why value stocks did not outperform growth stocks during the years 1991-1999. In graph 20 it is possible to see how the growth stocks outperformed value stocks during the years 1998-1999. It is also hard to argue for a behavioral explanation to why the value effect is apparent in some periods but not in others. One explanation is that the value effect is a result of its characteristics (Daniel and Titman, 1996). Another explanation by Barberis, Shleifer and Vishny (1998) is that it is a result of investors making systematic errors when evaluating public information to make expectations of the future. But why would this be the case in some periods but not in others?

Investors today have many strategies for generating positive abnormal returns. Among fund managers it is popular to focus on either value or growth stocks. Even if some of the abnormal returns of value stocks might be explained by increased risk, our findings suggest that there still might be a good idea to invest in value stocks since they have

performed higher returns during the last decade. This can also explain why many investors choose to invest in mutual funds that focus on value stocks.

The same is true for small firms. Our findings suggest that small firms have continued to perform better than big firms. It is very hard to tell if this is due to risk that is not captured by the market beta or mispricing. Anyway, this creates a good business case for all the small-capitalization mutual funds that only invest in firms with low market capitalizations.

Many investors say that they are long-term investors. In graph 21 we showed that a long-term investor, investing in the market-portfolio, would actually have underperformed the US treasury bills by approximately 20% for the 10 years. During this time, the portfolio HML performed 117%. It is of course impossible to determine how the market will perform in the future but our findings suggest that it might be necessary to try to find an active investment strategy to be able to generate good returns.

We have shown that a strategy of investing in value-stocks and short-selling growth stocks would have given good returns. The strategy of investing in small firms and short-selling big firms would also have given good returns. However, an investor that wants the very best returns needs to find out when to invest in value stocks and when to invest in growth stocks since value stocks do not always outperform growth stocks. The same is true for investing in small firms. Small firms have outperformed big firms but not every year. The fact that SMB and HML are negatively correlated suggests that there is a case for combining these two strategies. Our conclusion is that value and size strategies may be successful in the future. However the fact that value and size strategies have been successful today does not mean that it will be so in the future. To be able to make a stronger statement a greater understanding for what causes the value and size effect to appear in some period but not in others is needed.

Asness, Moskowitz and Pedersen (2009) found that value and momentum exhibit interesting dynamic effects. The dynamic between SMB and HML may also be an interesting issue to investigate. The Asness, Moskowitz and Pedersen (2009) publication find indications that there is a link between momentum and value effect and liquidity risk. Since small stocks are often less liquid and associated with higher trading costs there might be a connection between size and liquidity risk as well.

SUGGESTIONS FOR FUTURE RESEARCH

It would be interesting to further examine what drives the abnormal returns for value stocks and stocks with a low market capitalization. Is the return created by a previous mispricing or from risks that are not included in the CAPM?

It would also be interesting to further examine during which periods value stocks perform better than growth stocks and when small firms perform better than large firms and vice versa. Which leading indicators can be found? Is it possible to generate abnormal returns by observing these indicators and then reallocate between value and growth stocks and between small and large firms?

REFERENCES

Amihud, Yakov, Bent Jesper Christensen and, Haim Mendelson, H., 1992, Further evidence on the risk-return relationship, working paper, New York University.

Asness, Clifford S., Tobias J. Moskowitz and Lasse Heje Pedersen , 2009, Value and Momentum Everywhere, *AFA 2010 Atlanta Meetings Paper*.

Banz, Rolf W., 1981, The relationship between return and market value of common stocks, *Journal of Financial Economics* 9, 3-18.

Barberis, Nicholas, Andrei Shleifer and Robert W. Vishny, 1998, A Model of Investor Sentiment, *Journal of Financial Economics* 49 (3): 307–343.

Barberis, Nicholas C., and Richard H. Thaler, 2003, A survey of behavioral finance, In: George M. Constantinides, Milton Harris, and René M. Stulz, eds. *Handbook of the Economics of Finance: Volume 1B, Financial Markets and Asset Pricing*. Elsevier North Holland, Chapter 18, 1053–1128.

Bhandari L.C., 1988, Debt/Equity Ratio and Expected Common Stock Returns: Empirical Evidence, *Journal of Finance* 43, 507-28.

Black, Fischer, 1993, Estimating Expected Return, *Financial Analysts Journal*, Vol. 49, No. 5 Sep. - Oct., 36-38.

Black, Fischer, Michael C. Jensen and Myron S. Scholes, 1972, The Capital Asset Pricing Model: Some Empirical Tests., *Studies in the Theory of Capital Markets* (Praeger, New York)

Carhart, Mark M., On Persistence in Mutual Fund Performance, 1996, *The Journal of Finance*, Vol. 52, No. 1 , 57-82.

Chen, Nai-Fu, Richard Roll, and Stephen A. Ross, 1986, Economic forces and the stock market, *Journal of Business* 59, 383-403.

Cochrane, John H., 1999, New facts in finance, *Economic Perspectives*, Federal Reserve Bank of Chicago.

Daniel, Kent and Sheridan Titman, 1996, Evidence on the Characteristics of Cross Sectional Variation in Stock Returns, *The Journal of Finance*, Vol. 52, No. 1, 1-33.

De Bondt, Werner F. M., and Richard Thaler, 1985, Does the stock market overreact? *The Journal of Finance* 40, (3), 793–805.

Fama, Eugene F., 1998, Market efficiency, long-term returns, and behavioral finance. *Journal of Financial Economics* 49, (3), 283–306.

Fama, Eugene F., and James D. MacBeth, 1973, Risk, Return, and Equilibrium: Empirical Tests, *Journal of Political Economy*, No. 71.

Fama, Eugene F., and Kenneth R. French, 1992, The cross-section of expected stock returns, *Journal of Finance* 47, 427-465.

Fama, Eugene F., and Kenneth R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3-56.

Fama, Eugene F., and Kenneth R. French, 1996, Multifactor explanations of reset pricing anomalies, *Journal of Finance*, forthcoming 51.

Grinblatt, Mark and Tobias J. Moskowitz, 1999, Do Industries Explain Momentum? *The Journal of Finance*, Vol. 54, No. 4, Papers and Proceedings, Fifty-Ninth Annual Meeting, American Finance Association, New York, New York, January 4-6, 1999 (Aug., 1999), 1249-1290

Heaton, John and Deborah Lucas, 1997, Market Frictions, Savings Behavior, and Portfolio Choice. *Macroeconomic Dynamics*, 1(1), 76-101.

Jagannathan, Ravi, and Zhenyu Wang, 1993, The CAPM is alive and well, Staff report 165, Federal Reserve Bank of Minneapolis.

Jagannathan, Ravi, and Zhenyu Wang, 1996, The conditional CAPM and the cross-section of expected returns, *Journal of Finance* 51 , 3-53

Jagannathan, Ravi and Ellen R. McGrattan, 1995, The CAPM Debate, *Federal Reserve Bank of Minneapolis Quarterly Review*. 19(4): 2-17.

Jegadeesh, Narasimhan, and Sheridan Titman, 1993, Returns to buying winners and selling losers: Implications for stock market efficiency, *Journal of Finance* 48, 65-91.

Kan, Raymond and Chu Zhang, 1999, Two-Pass Tests of Asset Pricing Models with Useless Factors, *The Journal of Finance*, Vol. 54, No. 1, 203-235.

Kritzman, Mark, 1993, What Practitioners Need to Know ... About Factor Methods, *Financial Analysts Journal*, Jan-Feb, 12-15.

Lakonishok, Josef, Andrei Shleifer, and Robert W. Vishny, 1994, Contrarian investment, extrapolation, and risk, *Journal of Finance* 49, 1541-1578.

Lintner, John, 1965, The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets, *Review of Economics and Statistics* 47, 13-37.

Markowitz, Harry, 1959, *Portfolio Selection: Efficient Diversification of Investments* (Wiley, New York).

Mossin, Jan, 1966, Equilibrium in a Capital Asset Market , *Econometrica*, Vol. 34, No. 4 (Oct., 1966), 768-783

Roll, Richard, 1977, A critique of the asset pricing theory's tests Part I: On past and potential testability of the theory, *Journal of Financial Economics* 4, 129-176.

Rosenberg, Barr, Kenneth Reid, and Ronald Lanstein, 1985, Persuasive evidence of market inefficiency, *Journal of Portfolio Management* 11, 9-17.

Ross, Stephen, 1976, The Arbitrage Theory of Capital Asset Pricing, *Journal of Economic Theory*, no. 13 (3): 341–360.

Rousseau, Roland and Paul van Rensburg, 2004, Time and the payoff to value investing, *Journal of Asset Management* (2004) 4, 318–325

Sharpe, William F., 1964, Capital asset prices: A theory of market equilibrium under conditions of risk, *Journal of Finance* 19, 425-442.

Treynor, Jack, 1962, Toward a theory of market value of risky assets. (Edited version, Craig W. French 2002)

APPENDIX

TABLES

Table 1

Summary Statistics for Simple Monthly Percent Excess returns on 25 Portfolios Formed on Size and BE/ME. Year 1991-2009.

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t . The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year $t-1$ divided by market equity for December of $t-1$. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year $t-1$ and June of year t and positive book equity data for year $t-1$. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

Book-to-Market Equity (BE/ME) Quintiles (year 1991-2009)											
Size	Low	2	3	4	High		Low	2	3	4	High
Summary Statistics											
	Mean monthly excess returns						Standard deviations				
small	0.18	0.98	0.99	1.17	1.31		8.62	7.19	5.67	5.33	5.88
2	0.48	0.71	1.01	0.92	1.02		7.43	5.64	4.99	5.17	6.07
3	0.49	0.76	0.92	0.89	1.25		6.93	5.20	4.70	4.81	5.23
4	0.71	0.76	0.77	0.90	0.75		6.14	4.86	5.02	4.75	5.35
Big	0.53	0.66	0.51	0.52	0.65		4.63	4.23	4.44	4.50	5.25

Table 2

Summary Statistics for Simple Monthly Percent Excess returns on 25 Portfolios Formed on Size and BE/ME. Year 1991-1999.

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

Book-to-Market Equity (BE/ME) Quintiles (year 1991-1999)											
Size	Low	2	3	4	High		Low	2	3	4	High
Summary Statistics											
	Mean monthly excess returns						Standard deviations				
small	0.72	1.40	1.33	1.44	1.62		6.82	5.80	4.78	4.33	4.49
2	1.09	0.95	1.20	1.16	1.27		6.52	4.86	4.08	4.16	4.33
3	1.22	1.09	1.07	1.05	1.32		6.14	4.69	4.00	3.87	3.86
4	1.36	1.00	1.14	1.09	1.12		5.33	4.24	3.95	3.33	3.66
Big	1.45	1.23	1.07	1.05	1.20		4.28	3.96	3.86	3.65	4.15

Table 3

Summary Statistics for Simple Monthly Percent Excess returns on 25 Portfolios Formed on Size and BE/ME. Year 2000-2009.

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

Book-to-Market Equity (BE/ME) Quintiles (year 2000-2009)											
Size	Low	2	3	4	High		Low	2	3	4	High
Summary Statistics											
	Mean monthly excess returns						Standard deviations				
small	-0.30	0.61	0.69	0.93	1.03		9.98	8.24	6.38	6.10	6.91
2	-0.06	0.49	0.84	0.71	0.79		8.14	6.28	5.70	5.94	7.31
3	-0.16	0.47	0.79	0.75	1.18		7.54	5.63	5.27	5.53	6.22
4	0.12	0.54	0.43	0.73	0.42		6.75	5.37	5.81	5.74	6.50
Big	-0.30	0.14	0.00	0.05	0.15		4.80	4.41	4.86	5.11	6.05

Table 4

Three-Factor regressions for Simple Monthly Excess Returns on 25 Portfolios Formed on Size and BE/M. Year 1991-2009. ($R_{it} - R_{ft} = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$)

Rm-Rf, the excess return on the market, is the value-weighted return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month US Treasury bill rate (from Ibbotson Associates). SMB is the excess return of small firms compared to large firms. A firm is small when the market value of equity is lower than the median value from NYSE. HML is the excess return of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section)

Book-to-Market Equity (BE/ME) Quintiles (year 1991-2009)											
Size	Low	2	3	4	High	Low	2	3	4	High	
Regressions: $R_{it} - R_{ft} = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$											
	a					t(a)					
small	-0.66	0.12	0.16	0.29	0.24	-3.80	0.90	1.56	2.56	2.25	
2	-0.27	-0.12	0.14	-0.04	-0.16	-2.50	-1.07	1.55	-0.35	-1.36	
3	-0.12	-0.01	0.12	0.03	0.28	-1.07	-0.11	0.95	0.18	1.75	
4	0.16	0.00	-0.06	0.09	-0.20	1.49	0.03	-0.41	0.70	-1.36	
Big	0.21	0.14	-0.12	-0.18	-0.14	2.79	1.30	-1.02	-1.74	-0.78	
	b					t(b)					
small	1.13	0.94	0.85	0.82	0.98	28.59	28.30	30.87	24.40	43.96	
2	1.11	0.96	0.90	0.93	1.09	41.97	33.68	41.65	34.53	27.55	
3	1.08	1.01	0.95	0.95	1.02	39.71	28.75	25.42	24.79	21.23	
4	1.06	1.03	1.07	0.99	1.10	39.41	25.60	21.92	28.15	23.86	
Big	0.95	0.93	0.97	0.95	1.04	50.39	26.95	26.80	43.23	19.67	
	s					t(s)					
small	1.33	1.31	1.03	0.97	1.00	17.21	19.36	22.58	19.35	24.25	
2	1.01	0.83	0.73	0.75	0.90	24.85	18.76	15.41	21.18	23.81	
3	0.74	0.44	0.33	0.34	0.41	16.40	7.42	5.68	6.96	6.19	
4	0.44	0.21	0.13	0.20	-0.28	7.02	3.45	1.87	3.24	-10.46	
Big	-0.24	-0.24	-0.18	-0.21	-0.15	-6.18	-6.18	-4.43	-6.36	-2.00	
	h					t(h)					
small	-0.36	0.00	0.26	0.46	0.71	-5.20	0.08	6.27	10.16	17.33	
2	-0.33	0.21	0.48	0.65	0.89	-7.53	4.12	11.61	15.60	19.39	
3	-0.46	0.27	0.52	0.67	0.79	-11.07	4.71	9.99	9.39	12.46	
4	-0.41	0.36	0.55	0.57	0.82	-8.73	6.33	7.97	9.82	15.32	
Big	-0.33	0.19	0.38	0.64	0.70	-12.32	4.12	8.20	15.35	9.24	
	R ²										
small	0.90	0.92	0.93	0.91	0.92						
2	0.95	0.92	0.92	0.91	0.93						
3	0.94	0.86	0.85	0.83	0.83						
4	0.93	0.86	0.85	0.85	0.85						
Big	0.94	0.87	0.86	0.88	0.75						

Table 5

Three-Factor regressions for Simple Monthly Excess Returns on 25 Portfolios Formed on Size and BE/M. Year 1991-1999. $(R_{it} - R_{ft} = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it})$

Rm-Rf, the excess return on the market, is the value-weighted return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month US Treasury bill rate (from Ibbotson Associates). SMB is the excess return of small firms compared to large firms. A firm is small when the market value of equity is lower than the median value from NYSE. HML is the excess return of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section)

Book-to-Market Equity (BE/ME) Quintiles (year 1991-1999)											
Size	Low	2	3	4	High	Low	2	3	4	High	
$(R_{it} - R_{ft} = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it})$											
	a					t(a)					
small	-0.61	0.12	0.11	0.26	0.40	-2.78	0.68	0.92	1.74	2.64	
2	-0.38	-0.36	0.00	-0.13	-0.09	-2.49	-3.32	0.02	-0.96	-0.63	
3	-0.18	-0.30	-0.26	-0.26	0.01	-1.11	-1.91	-1.67	-1.83	0.04	
4	0.05	-0.42	-0.27	-0.10	-0.10	0.31	-2.55	-1.90	-0.87	-0.45	
Big	0.34	-0.10	-0.27	-0.26	-0.22	2.85	-0.73	-1.64	-1.75	-1.03	
	b					t(b)					
small	1.02	0.98	0.94	0.92	0.95	18.11	22.37	23.89	19.58	22.24	
2	1.14	1.02	0.93	1.01	1.06	25.71	34.23	25.81	29.74	19.45	
3	1.09	1.09	1.05	1.03	1.04	24.38	23.04	23.16	25.93	24.89	
4	1.04	1.12	1.12	0.95	0.97	27.54	21.85	27.76	28.58	11.49	
Big	0.90	1.08	1.08	1.05	1.14	23.38	24.36	17.52	27.72	16.39	
	s					t(s)					
small	1.38	1.28	1.02	0.95	1.05	14.86	13.31	19.87	15.37	16.27	
2	1.08	0.88	0.78	0.78	0.84	19.67	19.00	18.67	13.17	15.35	
3	0.78	0.67	0.49	0.51	0.49	12.59	9.59	8.04	9.91	10.35	
4	0.42	0.35	0.27	0.17	0.19	6.85	5.06	4.46	3.57	2.79	
Big	-0.33	-0.21	-0.21	-0.14	-0.03	-5.91	-3.69	-3.37	-2.73	-0.47	
	h					t(h)					
small	-0.33	0.09	0.24	0.49	0.68	-3.37	0.77	4.02	7.49	8.64	
2	-0.40	0.11	0.38	0.66	0.76	-5.61	1.78	6.01	8.08	13.62	
3	-0.52	0.24	0.55	0.66	0.76	-6.55	2.98	6.82	8.05	11.56	
4	-0.49	0.39	0.54	0.47	0.61	-5.97	4.73	7.09	7.01	7.53	
Big	-0.49	0.20	0.40	0.61	0.89	-8.48	2.80	5.70	8.90	9.08	
	R ²										
small	0.91	0.90	0.93	0.90	0.90						
2	0.95	0.95	0.92	0.89	0.91						
3	0.92	0.88	0.86	0.87	0.86						
4	0.92	0.86	0.89	0.88	0.74						
Big	0.92	0.88	0.86	0.86	0.78						

Table 6

Three-Factor regressions for Simple Monthly Excess Returns on 25 Portfolios Formed on Size and BE/M. Year 2000-2009. ($R_{it} - R_{ft} = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$)

Rm-Rf, the excess return on the market, is the value-weighted return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month US Treasury bill rate (from Ibbotson Associates). SMB is the excess return of small firms compared to large firms. A firm is small when the market value of equity is lower than the median value from NYSE. HML is the excess return of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section)

Book-to-Market Equity (BE/ME) Quintiles (year 2000-2009)											
Size	Low	2	3	4	High	Low	2	3	4	High	
Regressions: $R_{it} - R_{ft} = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$											
	a					t(a)					
small	-0.50	0.08	0.04	0.18	0.14	-1.90	0.44	0.26	1.01	0.84	
2	-0.23	0.00	0.20	-0.04	-0.25	-1.52	-0.03	1.44	-0.29	-1.46	
3	-0.10	0.19	0.39	0.22	0.52	-0.60	1.08	2.10	0.95	1.91	
4	0.28	0.31	0.09	0.29	-0.15	1.74	1.76	0.40	1.38	-0.80	
Big	0.09	0.16	-0.14	-0.26	-0.12	0.98	1.10	-0.87	-1.86	-0.43	
	b					t(b)					
small	1.194	0.928	0.791	0.768	0.985	21.83	20.46	22.48	19.06	35.62	
2	1.094	0.918	0.871	0.901	1.085	29.66	24.7	38.24	26.02	21.72	
3	1.075	0.994	0.932	0.931	1.016	29.92	24.75	22.61	20.92	16.51	
4	1.068	1.006	1.050	1.008	1.145	28.21	20.98	15.97	20.18	20.32	
Big	0.950	0.864	0.918	0.899	1.015	48.08	24.79	23.34	34.01	13.66	
	s					t(s)					
small	1.280	1.333	0.997	0.986	0.989	12.42	20.46	15.63	13.24	20.28	
2	0.989	0.815	0.712	0.742	0.945	17.55	14.45	12.64	17.17	18.56	
3	0.721	0.333	0.253	0.264	0.359	11.32	5.03	3.44	4.51	4	
4	0.447	0.131	0.054	0.194	0.085	4.95	1.77	0.59	2.2	1.59	
Big	-0.250	-0.229	-0.151	-0.217	-0.200	-7.66	-4.88	-2.87	-5.88	-1.82	
	h					t(h)					
small	-0.412	-0.020	0.306	0.483	0.715	-4.27	-0.31	5.98	8.52	14.96	
2	-0.286	0.269	0.533	0.667	0.957	-5.28	4.32	10.96	14.46	17.22	
3	-0.432	0.280	0.507	0.673	0.797	-9.1	4.1	8.71	7.46	9.57	
4	-0.385	0.350	0.557	0.599	0.874	-6.72	5.22	6.26	7.61	13.35	
Big	-0.268	0.229	0.402	0.683	0.635	-9.8	4.16	6.77	13.89	6.34	
	R ²										
small	0.901	0.936	0.940	0.916	0.932						
2	0.952	0.919	0.926	0.927	0.942						
3	0.953	0.876	0.868	0.838	0.830						
4	0.939	0.882	0.836	0.842	0.886						
Big	0.961	0.881	0.862	0.897	0.745						

Table 7

Summary Statistics for the Excess Return of the Market, SMB, HML and the Risk Free Rate. Year 1991-2009.

R_m-R_f, the excess return on the market, is the value-weighted monthly return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month US Treasury bill rate (from Ibbotson Associates). SMB is the excess return of small firms compared to large firms per month. A firm is small when the market value of equity is lower than the median value from NYSE. HML is the excess return, per month, of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section)

(Year 1991-2009)					
Variable	Obs	Mean	Std. Dev.	Min	Max
R _m -R _f	228	0.55	4.43	-18.55	11.05
SMB	228	0.27	3.57	-16.85	21.99
HML	228	0.38	3.41	-12.37	13.87
R _f	228	0.30	0.15	0.00	0.56

Table 8

Summary Statistics for the Excess Return of the Market, SMB, HML and the Risk Free Rate. Year 1991-1999.

$R_m - R_f$, the excess return on the market, is the value-weighted monthly return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month US Treasury bill rate (from Ibbotson Associates). SMB is the excess return of small firms compared to large firms per month. A firm is small when the market value of equity is lower than the median value from NYSE. HML is the excess return, per month, of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section)

(Year 1991-1999)					
Variable	Obs	Mean	Std. Dev.	Min	Max
$R_m - R_f$	108	1.25	3.71	-16.2	10.3
SMB	108	0.04	2.97	-6.75	8.41
HML	108	0.00	2.83	-8.98	6.47
R_f	108	0.38	0.08	0.21	0.54

Table 9

Summary Statistics for the Excess Return of the Market, SMB, HML and the Risk Free Rate. Year 2000-2009.

$R_m - R_f$, the excess return on the market, is the value-weighted monthly return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month US Treasury bill rate (from Ibbotson Associates). SMB is the excess return of small firms compared to large firms per month. A firm is small when the market value of equity is lower than the median value from NYSE. HML is the excess return, per month, of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section)

(Year 2000-2009)					
Variable	Obs	Mean	Std. Dev.	Min	Max
$R_m - R_f$	120	-0.09	4.93	-18.55	11.05
SMB	120	0.47	4.04	-16.85	21.99
HML	120	0.72	3.84	-12.37	13.87
R_f	120	0.23	0.16	0.00	0.56

Table 10

Two Pass Cross Sectional Regression Estimation of the Parameters in the Three Factor Model Year 1991-2009.

Rm-Rf, the excess return on the market, is the value-weighted return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month US Treasury bill rate (from Ibbotson Associates). SMB is the excess return of small firms compared to large firms. A firm is small when the market value of equity is lower than the median value from NYSE. HML is the excess return of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section)

We use a two pass cross sectional regression method to estimate the parameters in the three factor model: $R_{it} - R_{ft} = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$. First each of the 25 portfolios' return is regressed against the risk factors; market risk, SMB and HML. These time-series regressions give us the estimated betas for each portfolio with respect to each risk factor. Then the portfolios' returns are regressed against the estimated betas to determine the risk premium for each factor in the following formula:

$$\overline{R_{i,t}} - \overline{R_{f,t}} = \lambda_0 + \lambda_1 * \widehat{b}_i + \lambda_2 * \widehat{s}_i + \lambda_3 * \widehat{h}_i$$

where \widehat{b}_i is the estimated value of b_i , \widehat{s}_i is the estimated value of s_i and \widehat{h}_i is the estimated value of h_i .

We do this by using the toolbox xtfmb in STATA.

Fama-MacBeth regression (Year 1991-2009)						
Estimates	Coef.	Std. Err.	t	P> t	95% Conf.	Interval]
λ_1	-1.15	0.48	-2.42	0.02	-2.09	-0.21
λ_2	0.22	0.24	0.89	0.37	-0.26	0.69
λ_3	0.40	0.23	1.71	0.09	-0.06	0.85
λ_0	1.70	0.36	4.71	0.00	0.99	2.41

Table 11

Two Pass Cross Sectional Regression Estimation of the Parameters in the Three Factor Model Year 1991-1999.

Rm-Rf, the excess return on the market, is the value-weighted return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month US Treasury bill rate (from Ibbotson Associates). SMB is the excess return of small firms compared to large firms. A firm is small when the market value of equity is lower than the median value from NYSE. HML is the excess return of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section)

We use a two pass cross sectional regression method to estimate the parameters in the three factor model: $R_{it} - R_{ft} = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$. First each of the 25 portfolios' return is regressed against the risk factors; market risk, SMB and HML. These time-series regressions give us the estimated betas for each portfolio with respect to each risk factor. Then the portfolios' returns are regressed against the estimated betas to determine the risk premium for each factor in the following formula:

$$\overline{R_{i,t}} - \overline{R_{f,t}} = \lambda_0 + \lambda_1 * \widehat{b}_i + \lambda_2 * \widehat{s}_i + \lambda_3 * \widehat{h}_i$$

where \widehat{b}_i is the estimated value of b_i , \widehat{s}_i is the estimated value of s_i and \widehat{h}_i is the estimated value of h_i .

We do this by using the toolbox xtfmb in STATA.

Fama-MacBeth regression (Year 1991-1999)						
Estimates	Coef.	Std. Err.	t	P> t	95% Conf.	Interval]
λ_1	-1.19	0.64	-1.87	0.06	-2.46	0.07
λ_2	-0.02	0.29	-0.08	0.94	-0.60	0.55
λ_3	0.02	0.28	0.09	0.93	-0.53	0.57
λ_0	2.42	0.52	4.65	0.00	1.39	3.45

Table 12

Two Pass Cross Sectional Regression Estimation of the Parameters in the Three Factor Model Year 2000-2009

Rm-Rf, the excess return on the market, is the value-weighted return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month US Treasury bill rate (from Ibbotson Associates). SMB is the excess return of small firms compared to large firms. A firm is small when the market value of equity is lower than the median value from NYSE. HML is the excess return of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section)

We use a two pass cross sectional regression method to estimate the parameters in the three factor model: $R_{it} - R_{ft} = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$. First each of the 25 portfolios' return is regressed against the risk factors; market risk, SMB and HML. These time-series regressions give us the estimated betas for each portfolio with respect to each risk factor. Then the portfolios' returns are regressed against the estimated betas to determine the risk premium for each factor in the following formula:

$$\overline{R_{i,t}} - \overline{R_{f,t}} = \lambda_0 + \lambda_1 * \widehat{b}_i + \lambda_2 * \widehat{s}_i + \lambda_3 * \widehat{h}_i$$

where \widehat{b}_i is the estimated value of b_i , \widehat{s}_i is the estimated value of s_i and \widehat{h}_i is the estimated value of h_i .

We do this by using the toolbox xtfmb in STATA.

Fama-MacBeth regression (Year 2000-2009)							
Estimates	Coef.	Std. Err.	t	P> t	95% Conf.	Interval]	
λ_1	-0.85	0.61	-1.41	0.16	-2.05	0.35	
λ_2	0.39	0.38	1.03	0.31	-0.36	1.14	
λ_3	0.76	0.36	2.11	0.04	0.05	1.48	
λ_0	0.82	0.37	2.20	0.03	0.08	1.57	

GRAPHS

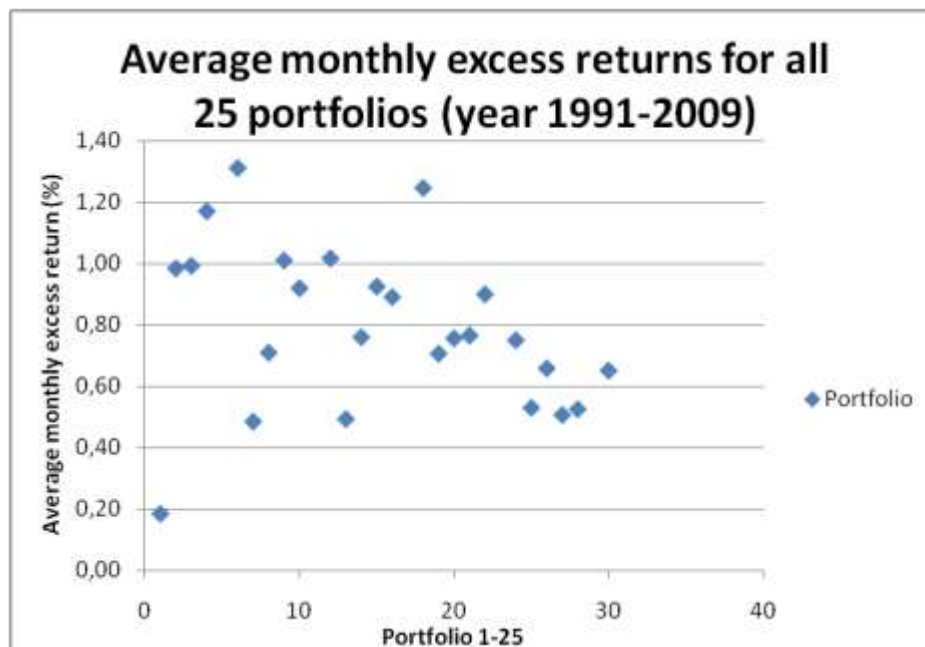
Graph 1

Average Monthly Excess Returns for the 25 Portfolios. Year 1991-2009

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t . The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year $t-1$ divided by market equity for December of $t-1$. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year $t-1$ and June of year t and positive book equity data for year $t-1$. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

Portfolio 1-25, where portfolio 1-5 are the portfolios with the smallest firms and 21-25, the portfolios with the biggest firms. Portfolio 5, 10, 15, 20 and 25 are the portfolios with the highest book-to-market equity ratio and portfolio 1,6,11,16 and 21 is the portfolios with the lowest book-to-market equity ratio.



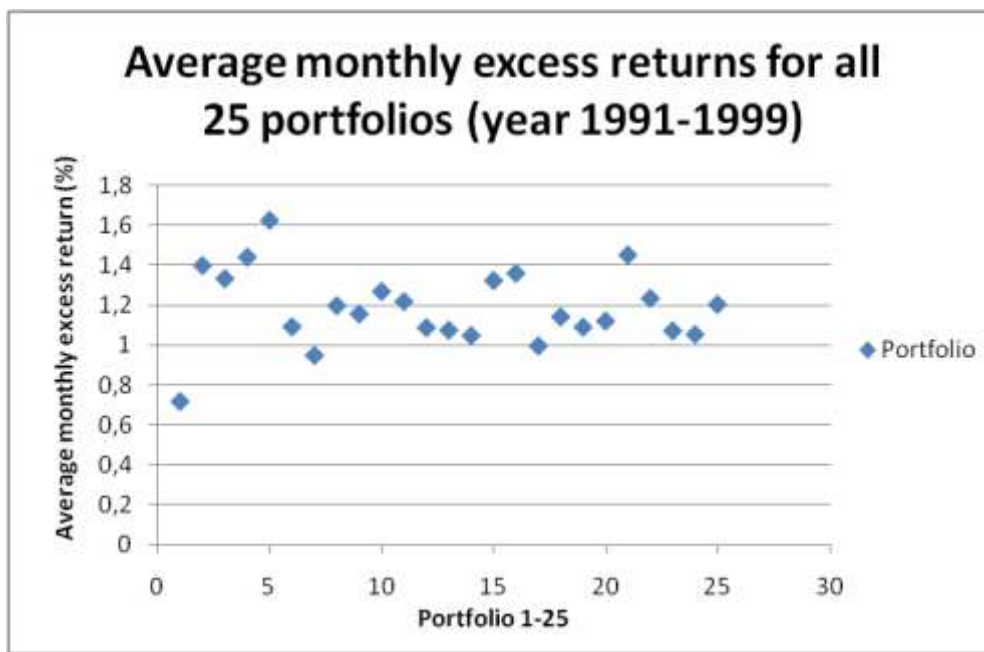
Graph 2

Average Monthly Excess Returns for the 25 Portfolios. Year 1991-1999

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t . The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year $t-1$ divided by market equity for December of $t-1$. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year $t-1$ and June of year t and positive book equity data for year $t-1$. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

Portfolio 1-25, where portfolio 1-5 are the portfolios with the smallest firms and 21-25, the portfolios with the biggest firms. Portfolio 5, 10, 15, 20 and 25 are the portfolios with the highest book-to-market equity ratio and portfolio 1,6,11,16 and 21 is the portfolios with the lowest book-to-market equity ratio.



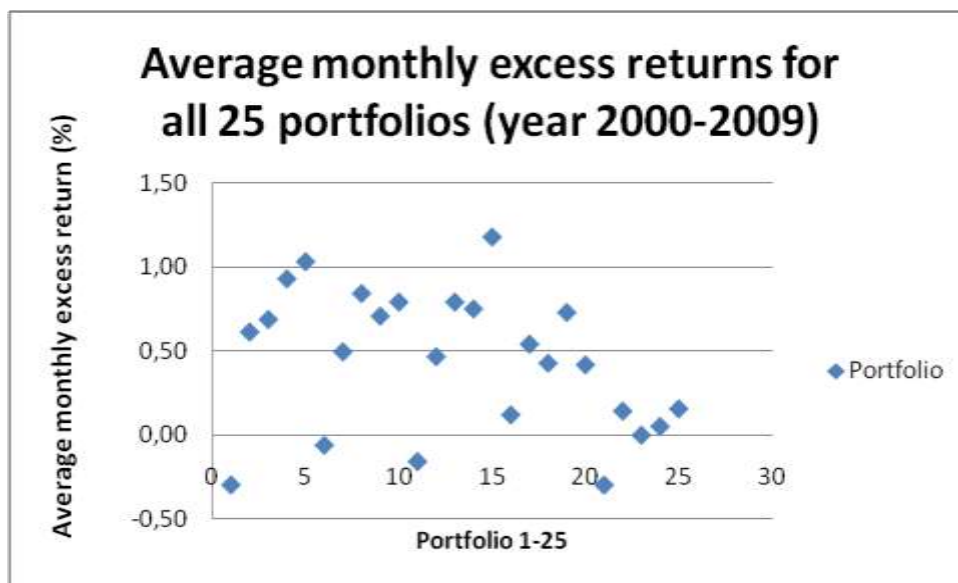
Graph 3

Average Monthly Excess Returns for the 25 Portfolios. Year 2000-2009

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

Portfolio 1-25, where portfolio 1-5 are the portfolios with the smallest firms and 21-25, the portfolios with the biggest firms. Portfolio 5, 10, 15, 20 and 25 are the portfolios with the highest book-to-market equity ratio and portfolio 1,6,11,16 and 21 is the portfolios with the lowest book-to-market equity ratio.



Graph 4

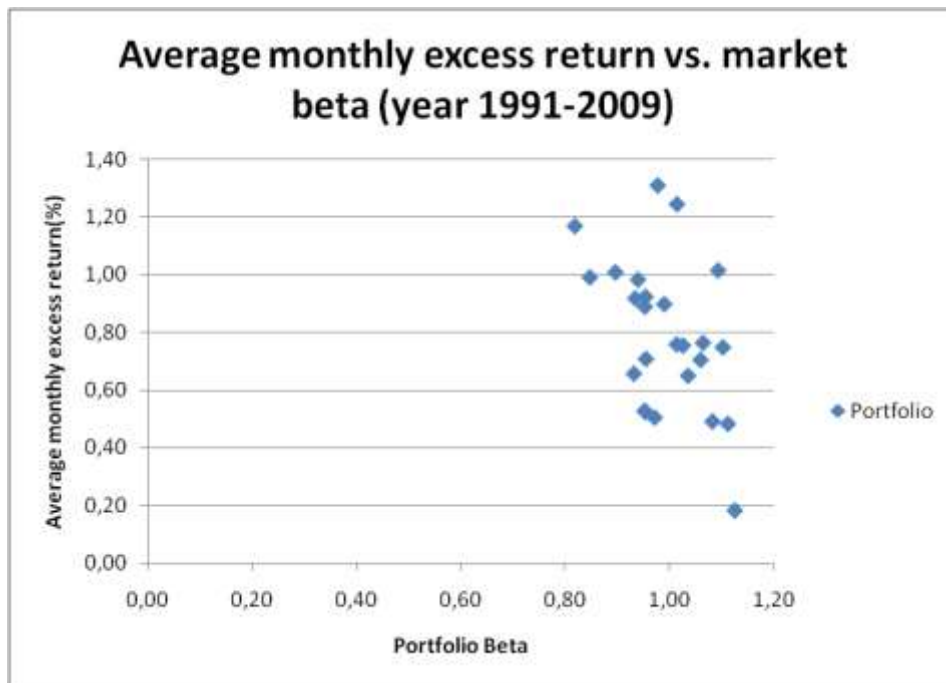
Average Monthly Excess Returns vs. Market Beta for the 25 Portfolios.

Year 1991-2009

$$(R_{it} - R_{ft}) = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.



Graph 5

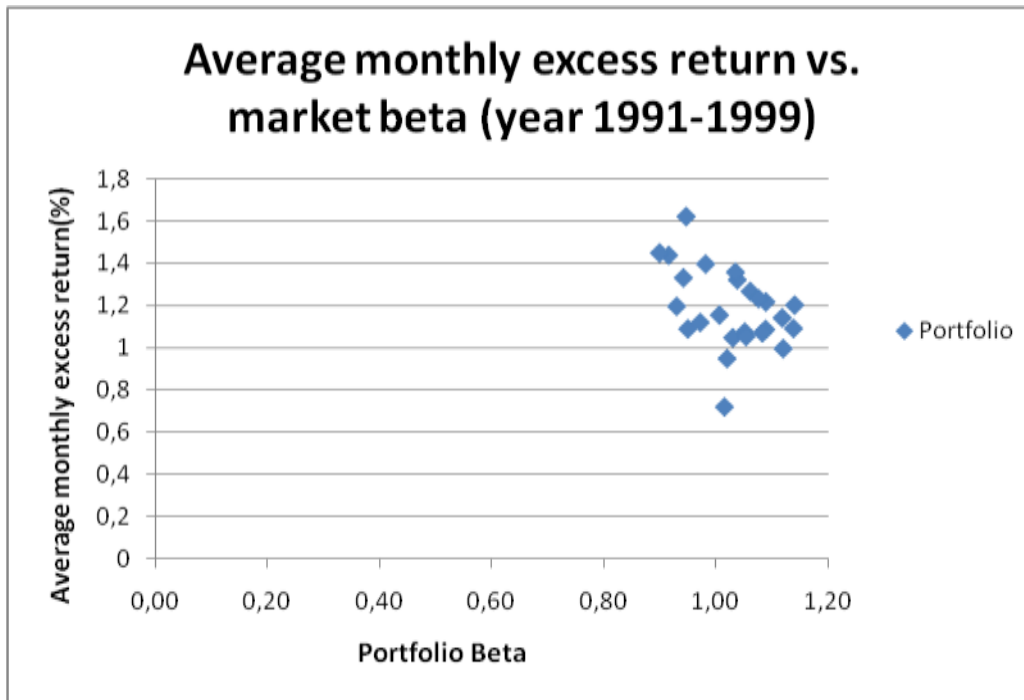
Average Monthly Excess Returns vs. Market Beta for the 25 Portfolios.

Year 1991-1999

$$(R_{it} - R_{ft}) = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.



Graph 6

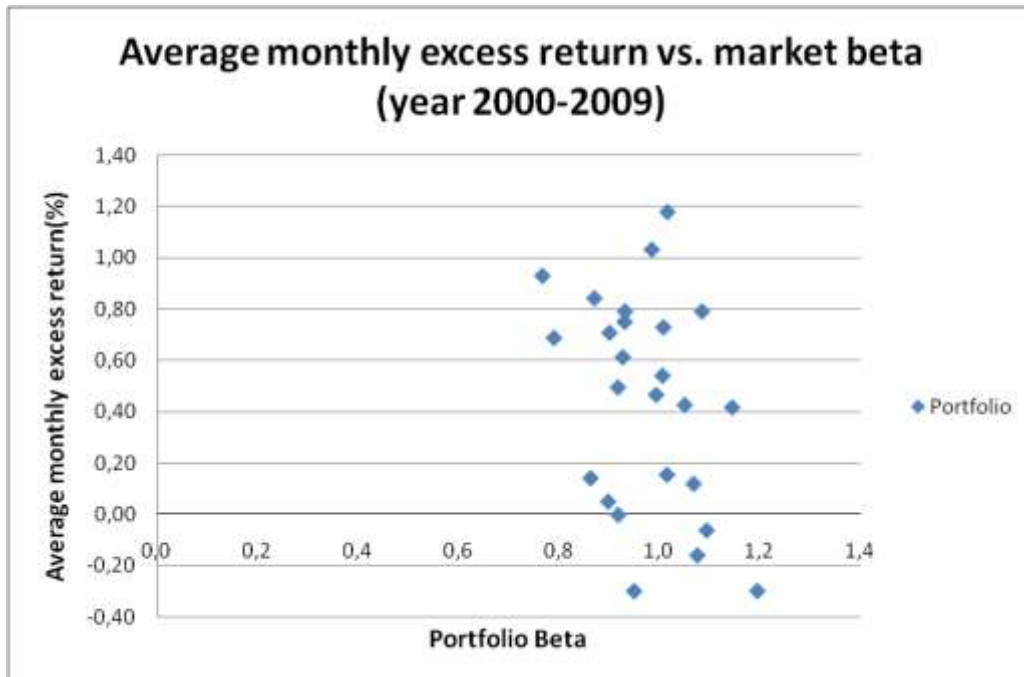
Average Monthly Excess Returns vs. Market Beta for the 25 Portfolios.

Year 2000-2009

$$(R_{it} - R_{ft}) = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.



Graph 7

Average Monthly Excess Returns vs. SMB-coefficient for the 25 Portfolios.

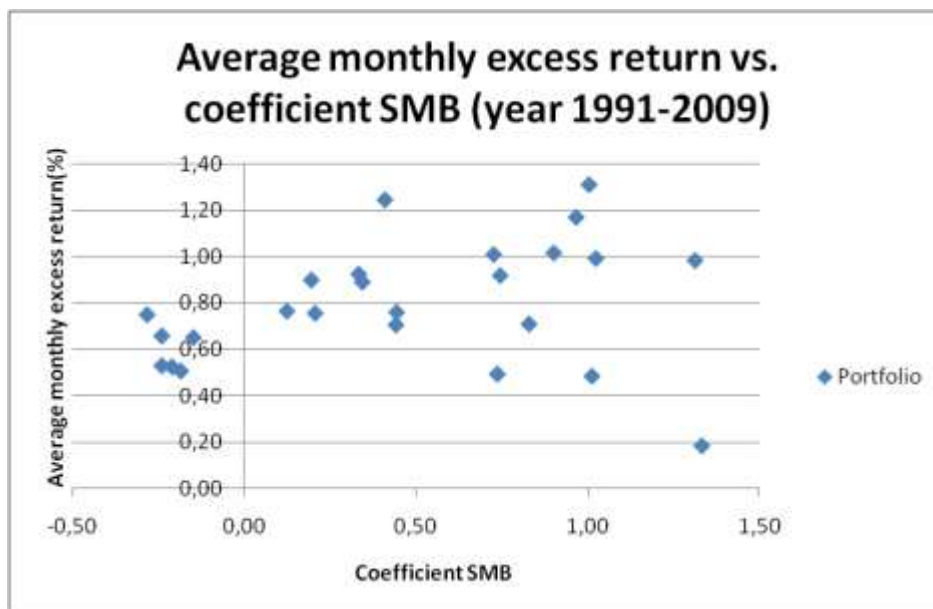
Year 1991-2009

$$(R_{it} - R_{ft}) = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

SMB is the excess return of small firms compared to large firms. A firm is small when the market value of equity is lower than the median value from NYSE. The graph reports the relationship between each portfolio's excess return and its SMB-coefficient from the regression above.



Graph 8

Average Monthly Excess Returns vs. SMB-coefficient for the 25 Portfolios.

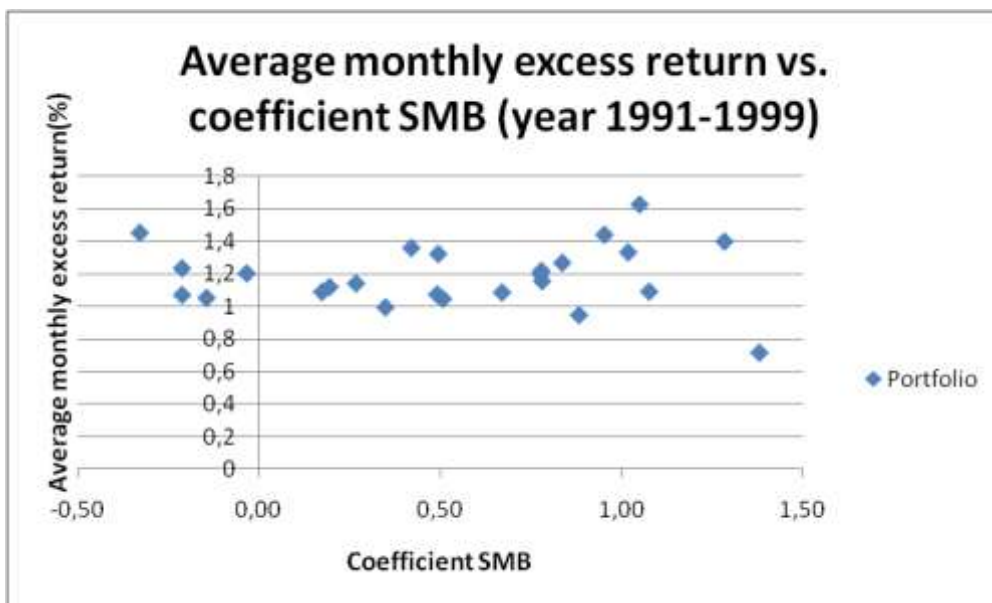
Year 1991-1999

$$(R_{it} - R_{ft}) = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

SMB is the excess return of small firms compared to large firms. A firm is small when the market value of equity is lower than the median value from NYSE. The graph reports the relationship between each portfolio's excess return and its SMB-coefficient from the regression above.



Graph 9

Average Monthly Excess Returns vs. SMB-coefficient for the 25 Portfolios.

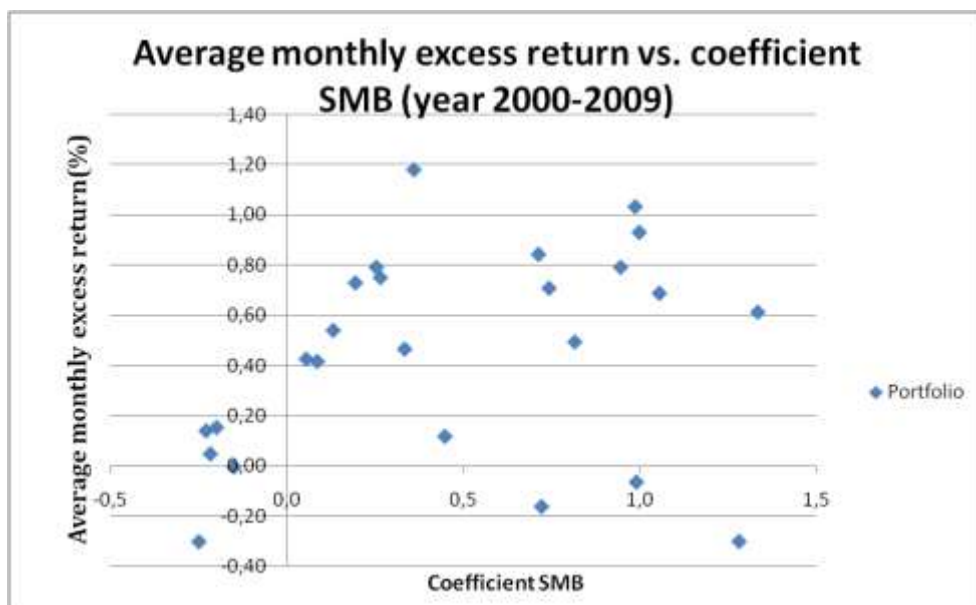
Year 2000-2009

$$(R_{it} - R_{ft}) = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

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SMB is the excess return of small firms compared to large firms. A firm is small when the market value of equity is lower than the median value from NYSE. The graph reports the relationship between each portfolio's excess return and its SMB-coefficient from the regression above.



Graph 10

Average Monthly Excess Returns vs. HML-coefficient for the 25 Portfolios.

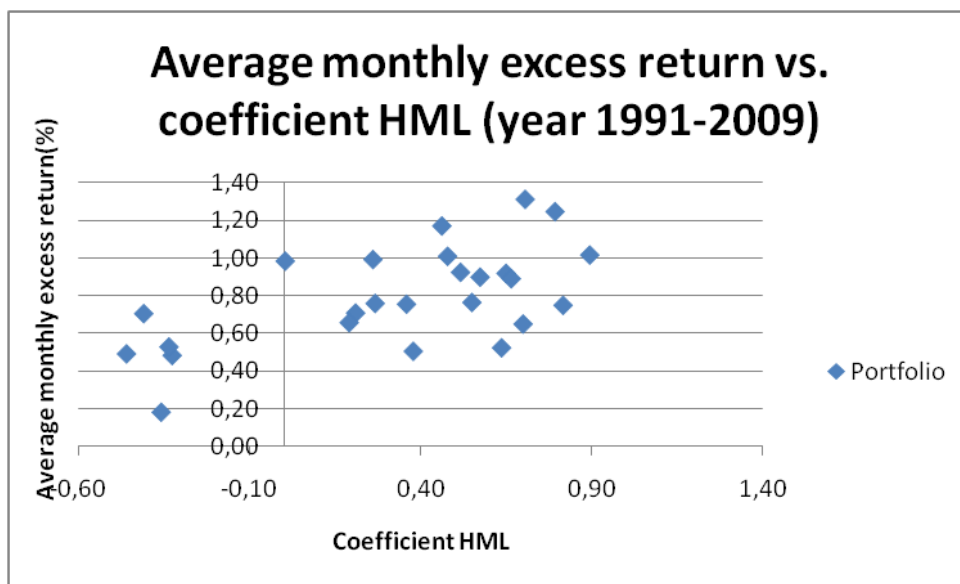
Year 1991-2009

$$(R_{it} - R_{ft}) = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

HML is the excess return of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section) The graph reports the relationship between each portfolio's excess return and its HML-coefficient from the regression above.



Graph 11

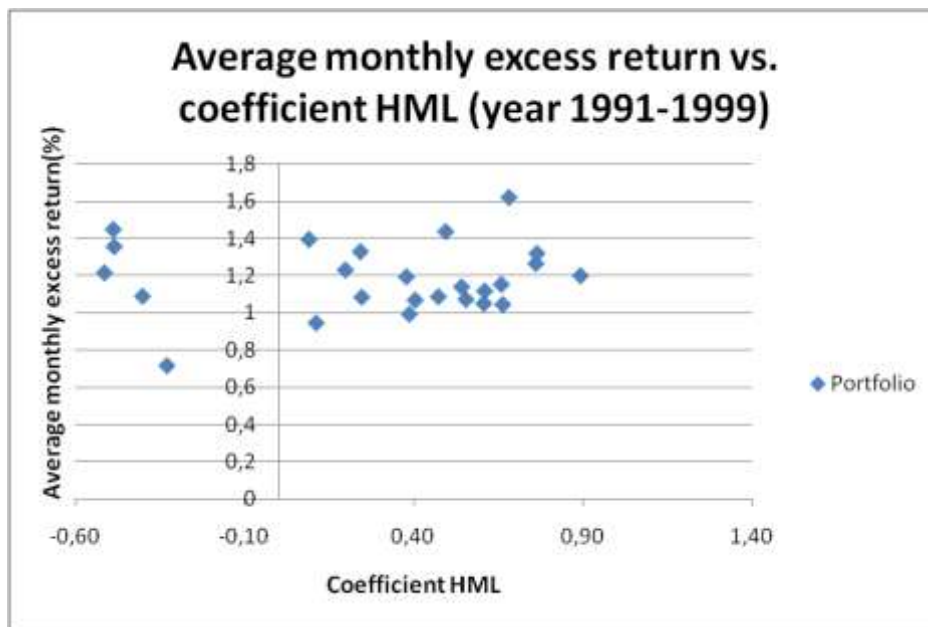
Average Monthly Excess returns vs. HML-coefficient for the 25 Portfolios. Year 1991-1999

$$(R_{it} - R_{ft}) = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

HML is the excess return of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section) The graph reports the relationship between each portfolio's excess return and its HML-coefficient from the regression above.



Graph 12

Average Monthly Excess Returns vs. HML-coefficient for the 25 Portfolios.

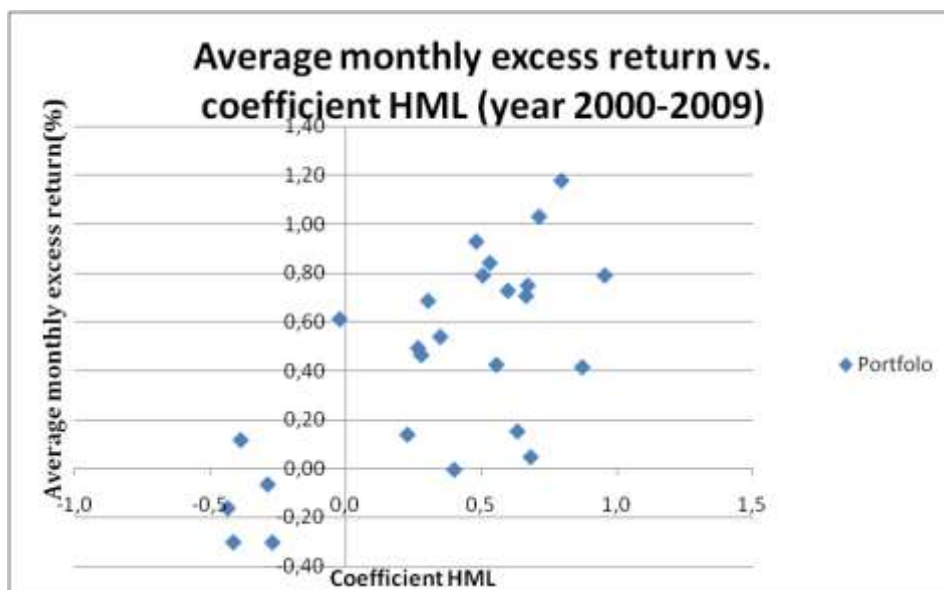
Year 2000-2009

$$(R_{it} - R_{ft}) = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

HML is the excess return of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section) The graph reports the relationship between each portfolio's excess return and its HML-coefficient from the regression above.



Graph 13

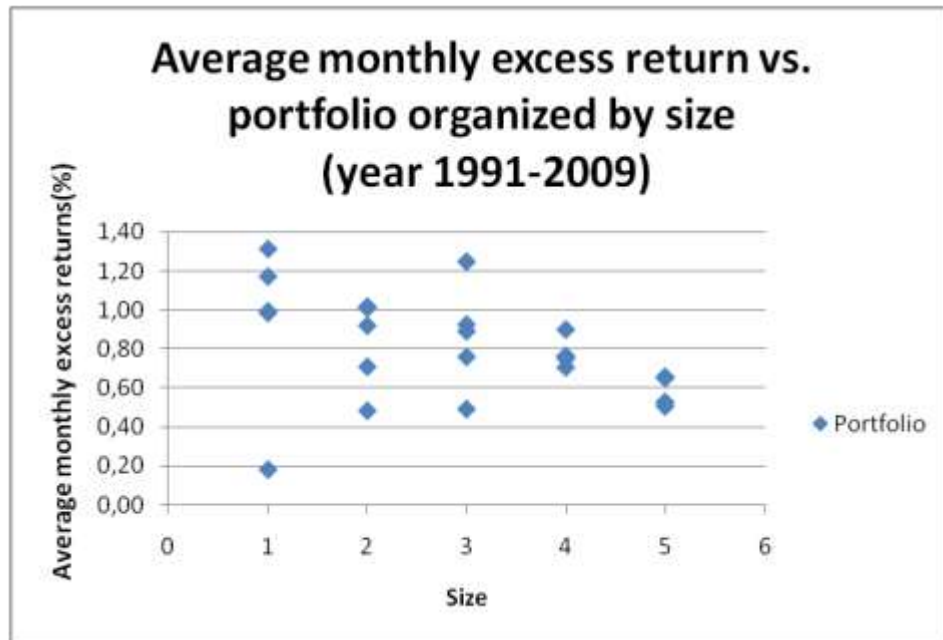
Average Monthly Excess Returns vs. Portfolio Organized by Size for the 25 Portfolios. Year 1991-2009

$$(R_{it} - R_{ft} = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it})$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

In this graph portfolio excess return is plotted against the portfolios organized by their size. Portfolios within size category 1 consist of the smallest firms while portfolios within size category 5 consist of the biggest firms.



Graph 14

Average Monthly Excess Returns vs. Portfolio Organized by Size for the 25 Portfolios. Year 1991-1999

$$(R_{it} - R_{ft}) = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

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Graph 15

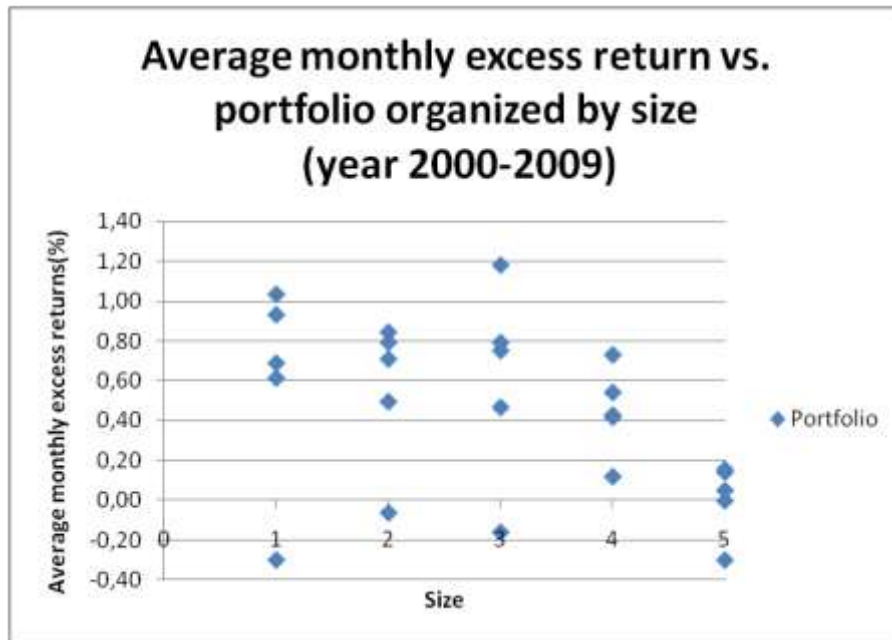
Average Monthly Excess Returns vs. Portfolio Organized by Size for the 25 Portfolios. Year 2000-2009

$$(R_{it} - R_{ft}) = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

In this graph portfolio excess return is plotted against the portfolios organized by their size. Portfolios within size category 1 consist of the smallest firms while portfolios within size category 5 consist of the biggest firms.



Graph 16

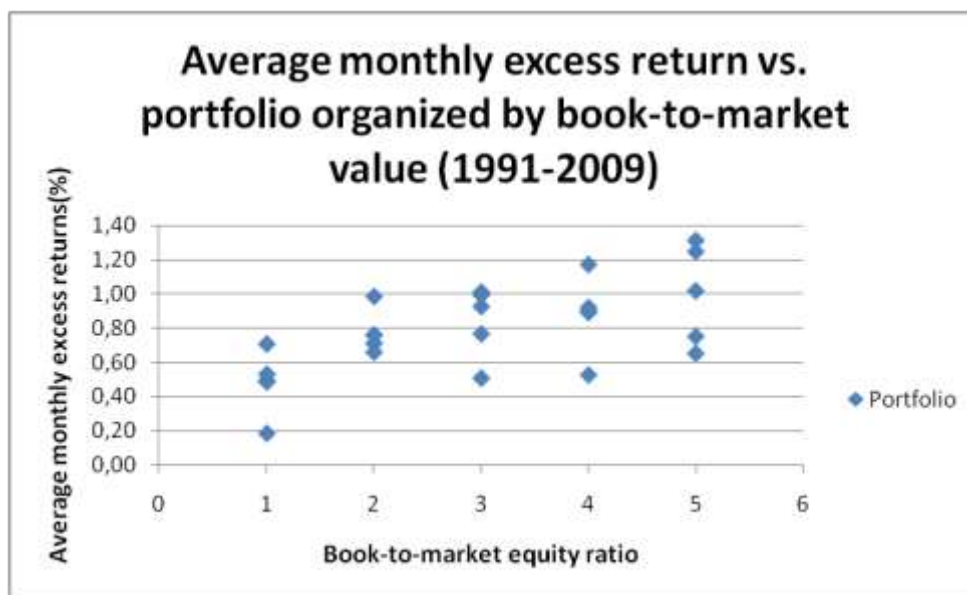
Average Monthly Excess Returns vs. Portfolio Organized by Book-to-Market Equity Ratio for the 25 Portfolios. Year 1991-2009

$$(R_{it} - R_{ft}) = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t . The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year $t-1$ divided by market equity for December of $t-1$. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year $t-1$ and June of year t and positive book equity data for year $t-1$. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

In this graph portfolio excess return is plotted against the portfolios organized by their book-to-market equity ratio. Portfolios within book-to-market equity ratio category 1 consist of the firms with the lowest ratio while portfolios within category 5 consist of the firms with the highest book-to-market equity ratio.



Graph 17

Average Monthly Excess Returns vs. Portfolio Organized by Book-to-Market Equity Ratio for the 25 Portfolios. Year 1991-1999

$$(R_{it} - R_{ft}) = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

The portfolios consist of stocks from the NYSE, AMEX and NASDAQ and include all stocks for which we have market equity data for December in year t-1 and June of year t and positive book equity data for year t-1. Portfolio excess return is calculated as the portfolio's return minus the 1 month US Treasury bill rate.

In this graph portfolio excess return is plotted against the portfolios organized by their book-to-market equity ratio. Portfolios within book-to-market equity ratio category 1 consist of the firms with the lowest ratio while portfolios within category 5 consist of the firms with the highest book-to-market equity ratio.



Graph 18

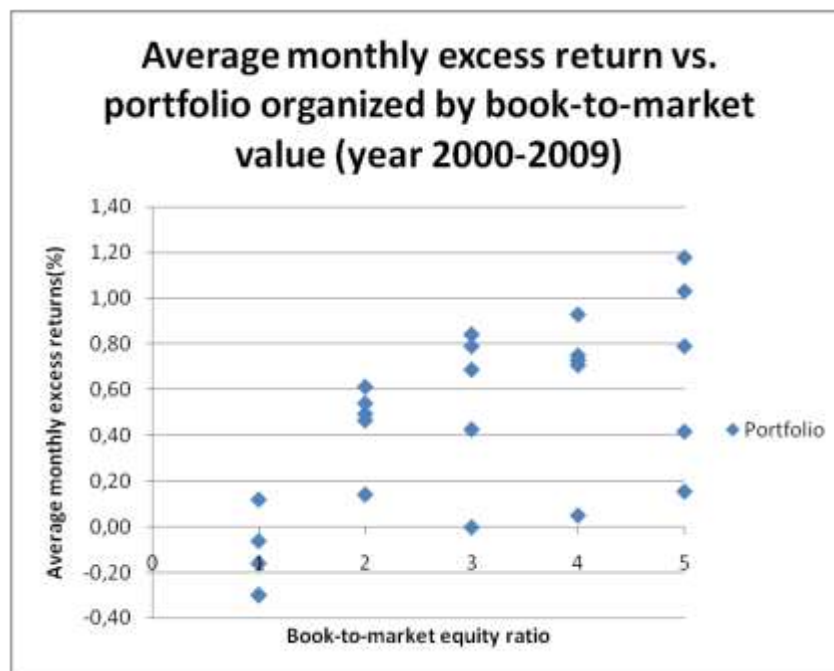
Average Monthly Excess Returns vs. Portfolio Organized by Book-to-Market Equity Ratio for the 25 Portfolios. Year 2000-2009

$$(R_{it} - R_{ft}) = a_i + b_i(R_{Mt} - R_{ft}) + s_iSMB_t + h_iHML_t + e_{it}$$

American firms are divided into five groups depending on their market equity. The same firms are also divided into five groups depending on their ratio of book equity to market equity. The portfolios in our tests are the intersections of the groups formed by market equity and book-to-market ratio. In total there are 25 portfolios. The breakpoints for size are the NYSE market equity quintiles at the end of June in year t. The book-to-market equity ratio is calculated as the book equity for the last fiscal year end in year t-1 divided by market equity for December of t-1. The breakpoints for book-to-market equity ratio are the NYSE BE/ME-quintiles.

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In this graph portfolio excess return is plotted against the portfolios organized by their book-to-market equity ratio. Portfolios within book-to-market equity ratio category 1 consist of the firms with the lowest ratio while portfolios within category 5 consist of the firms with the highest book-to-market equity ratio.



Graph 19

Cumulative Excess Return of the Market, SMB, HML. Year 1991-2009

$R_m - R_f$, the excess return on the market, is the value-weighted return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month US Treasury bill rate (from Ibbotson Associates). SMB is the excess return of small firms compared to large firms. A firm is small when the market value of equity is lower than the median value from NYSE. HML is the excess return of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section).

The returns are calculated on a daily basis and the cumulative return is the return an investor would have earned if holding one of these portfolios during the period. The cumulative returns does not take into account any transaction costs or taxes.

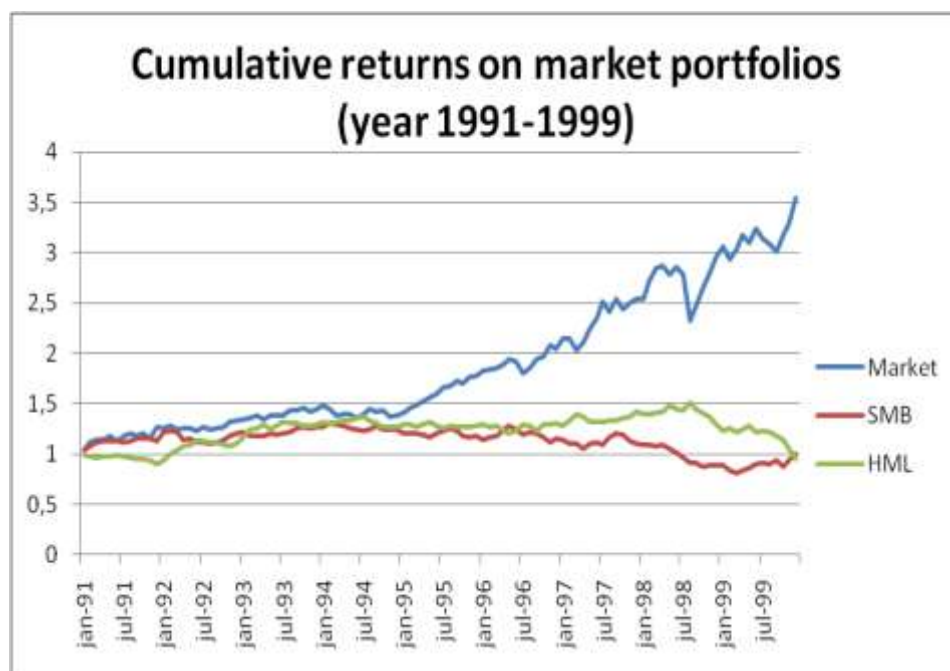


Graph 20

Cumulative Excess Return of the Market, SMB, HML. Year 1991-1999

Rm-Rf, the excess return on the market, is the value-weighted return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month US Treasury bill rate (from Ibbotson Associates). SMB is the excess return of small firms compared to large firms. A firm is small when the market value of equity is lower than the median value from NYSE. HML is the excess return of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section).

The returns are calculated on a daily basis and the cumulative return is the return an investor would have earned if holding one of these portfolios during the period. The cumulative returns does not take into account any transaction costs or taxes.



Graph 21

Cumulative Excess Return of the Market, SMB, HML. Year 2000-2009

Rm-Rf, the excess return on the market, is the value-weighted return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month US Treasury bill rate (from Ibbotson Associates). SMB is the excess return of small firms compared to large firms. A firm is small when the market value of equity is lower than the median value from NYSE. HML is the excess return of firms with high BE/ME-ratio compared to firms with low BE/ME-ratio. (For more detailed information see the Data section).

The returns are calculated on a daily basis and the cumulative return is the return an investor would have earned if holding one of these portfolios during the period. The cumulative returns does not take into account any transaction costs or taxes.

