The Comparative Effectiveness of Pricing Variables in the Chinese Stock Market

by

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Abstract

With the growing importance of the Chinese equity market, it becomes necessary to take another look at the effectiveness of the Fama-French three factor pricing model in the Chinese equity market, and to seek modified Fama-French pricing models that incorporate additional risk factors. I base my research on recent Chinese equity market returns data between 2000 and 2010.

I propose the addition of three additional types of pricing variables—measures of momentum, herd mentality and degree of government control—to the Fama-French three factor model. In this thesis I will examine the effectiveness of these individual pricing variables both on a stand-alone basis and in combination with the Fama-French three factor model. I will also compare the relative effectiveness of a variety of pricing models (26 in total) that are different combinations of the different risk factors. I aim to find a pricing model or a set of pricing models that are distinctly better than the rest in terms of explanatory power. I will further examine the effectiveness of the different pricing models through an out-of-sample test using trading rules. It is my hope that through this multi-faceted and rigorous analysis of pricing variables using recent data, we can walk another step in the never-ending quest of explaining variations in returns in the Chinese equity market.

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I. INTRODUCTION

The single watershed event in security pricing is the development of the Capital Asset Pricing Model (CAPM) by Sharpe, Lintner and Black, based on Markowitz's portfolio theory. For the first time their theory clearly prescribes that it is the individual stocks' co-movements with the overall markets that determine expected stock returns and prices. Stock returns depend only on the company beta, which is a measure of the systematic risk of the company. In recent years, Fama and French developed a three-factor pricing model in an attempt to improve the cross-section predictability of stock returns. Apart from beta, there are two separate risk measures to account for the impact of company size and company book-to-market value. This three-factor model has been widely tested and has proven to be useful for most mature equity markets, where it is able to explain about 90 percent of the cross-sectional variation in stock returns.

However, it is debatable whether the Fama-French pricing model is an effective asset pricing mechanism in the capital markets of emerging economies. Market imperfections in these markets suggest that the Fama-French pricing model does not effectively capture cross-sectional variation in average stock returns. Of these markets, China's is worthy of particular interest. The Chinese stock markets have grown at a phenomenal pace since their inception: the number of listed stocks has increased from 13 in 1991 to 1,353 by the end of 2004, and the aggregate market capitalization has risen from US$1.3 billion to more than US$400 billion during the same period (Eun and Huang, 2007). Spurred on by China's strong economic growth and expanding investment in its equity market by investors from developed markets, China's stock market share of global equity valuations is predicted to increase from 11% in 2010 to 28% in the next two decades. This means that by 2030, China's market capitalization would overtake the U.S.'s and become the highest in the world.

Due to the many imperfections and specific characteristics of China's stock markets, the Fama-French model might not be an effective predictor of stock returns in China. First, the majority of Chinese companies are controlled by government entities, with individuals holding minority stakes. Only about one third of all outstanding shares in China are publicly tradable. This means that the tradable shares often do not capture the essential risk characteristics of the companies and pricing of these tradable shares is often skewed for this reason. Second, for the one-third tradable shares, trading is dominated by numerous retail investors, with the total number of retail accounts exceeding 50 million. It is reported that at least 90% of turnover on the stock exchanges consists of trades by retail investors with limited funds. There are few institutional investors—such as pension funds, mutual funds, and insurance companies—that may otherwise act as a stabilizing force in the nascent stock markets. Third, only about 10% of the domestically listed companies have shares eligible for foreigners, such as B and H shares, with the remaining 90% of Chinese-listed companies off-limits to foreigners. This asymmetry in trading results in different prices for different groups of shares depending on their availability to foreign traders. Fourth, the majority of retail investors in China has a generally poor understanding of the markets and often adheres to a herd mentality. Also, these investors are interested more in short term gains and often ignore long term investment objectives based on future profitability of a firm. The average annual turnover from 1991 to 2002 is an amazing 500% on China's stock exchanges (Wang and Xu, 2004). These two factors cause great price volatility in the market. Finally, like many emerging markets, the Chinese market also suffers from unsatisfactory corporate governance, dubious accounting practice, market manipulation and insider trading problems. Owing to all the above market imperfections, researchers have tried to find alternative pricing models for the Chinese equity market.

Developing an effective pricing model for Chinese equity markets has a tremendous impact on all areas of equity trading and investment in China. There are also important implications for the determination of the cost of equity capital in China and also in other nascent and emerging stock markets around the world. In view of the recent opening of China's A-share markets to qualified foreign institutional investors, the findings of this paper should be of particular interest to international investors as well.

II. LITERATURE REVIEW

To date, there are only a handful of studies that aim to come up with systematic factors that drive stock prices and returns in Chinese equity markets. There are even fewer studies that test for the effectiveness of these pricing variables using trading rules. Moreover, my aim is not simply to duplicate the Fama-French pricing model or the few Chinese equity pricing models in other studies, but rather to synthesize these findings and test for combinations of successful pricing variables to come up with the most effective pricing model to date. This paper also hopes to provide a firm justification of that pricing model by doing out-of-sample tests, using trading rules based on the effective trading variables. Finally, by using the most recent data from the period of 2000 to 2011, this paper also hopes to improve the credibility of previous research findings as well as reach conclusions on how pricing models fare during the recent crisis.

A research paper titled "What Determines Chinese Stock Returns?" by Fenghua Wang and Yexiao Xu has concluded that a revised Fama-French model that includes beta, size and a floating ratio that reflects the expected corporate governance in China can effectively explain up to 90% of cross-sectional differences in Chinese stock returns from 1996-2002 (10% better than the Fama-French model) (Wang and Xu, 2004). They conclude that due to the speculative nature of the Chinese capital markets and low quality in the accounting information, the book-to-market variable included in the Fama-French model is not a good pricing variable for Chinese markets. Other researchers have devised more sophisticated pricing models. For example, according to Cheol S. Eun and Wei Huang, additional variables that capture Chinese investor sentiments, such as liquidity and offshore share programs of Chinese companies, need to be taken into account when developing a pricing model for China capital markets (Eun and Huang, 2007). However, to date there is no consensus among researchers on what pricing variables would be most appropriate for the Chinese markets.

As for trading rules to test the effectiveness of pricing variables, there is even less literature on it, and most published papers concern themselves with technical trading rules only. For example, Coutts and Kwong find that whereas the moving average and channel breakout rules generate marginal abnormal returns for the Hang Seng index between 1985 and 1997 before considering transaction costs, these excess returns disappear for the moving average crossover rule after considering transaction costs (Coutts and Kwong, 2000). A more concrete testing of specific technical trading rules can be found in "The Chinese Stock Market: An Examination of the Random Walk Model and Technical Trading Rules" by Nauzer J. Balsara, Gary Chen and Lin Zheng (Balsara, et al., 2007). Balsara, Chen and Zheng observed significant positive returns for individual stocks after transaction costs on buy trades generated by three commonly used technical trading rules: the moving average crossover rule, the channel breakout rule, and the Bollinger band breakout rule. Naturally, there is no consensus on the most effective trading rules for Chinese equity markets either.

Due to the scarcity of current research and by standing on the shoulders of previous researchers, there is great promise in arriving at new research results of an improved pricing model of the Chinese equity market backed by solid out-of-sample testing using trading rules.

III. FOUR AREAS OF INTEREST

This paper will explore the following four areas of interest in sequence:

1) Examine the effectiveness of Fama-French Model in China and compare it to the effectiveness of the model in the U.S.

We compile company data from 2000 to 2009 for all compatible Chinese companies on the Shanghai and Shenzhen exchanges. Using this data, we duplicate the Fama-French Method with regard to the Chinese equity market. Specifically, the Chinese companies are sorted into 6 benchmark portfolios based on size and book equity to market equity. 3 Fama/French benchmark factors, Rm-Rf, SMB (Small Minus Big), and HML (High Minus Low), are then constructed from six size/book-to-market benchmark portfolios. The suitability of the Fama-French model is then examined based on the regression of the 6 benchmark portfolios against the 3 benchmark factors.

2) Examine the effectiveness of three pairs of China-specific pricing variables when they are incorporated into the basic Fama-French model and when they are the only pricing variables

The 3 pairs of additional China-specific pricing variables are related specifically to momentum, herd mentality and degree of government control. We compare the R-squared and p-values of the pricing variables after running regressions on pricing models that include them. We test both the pricing models with them as the only pricing variables and modified Fama-French four-factor models that include them.

3) Compare 26 pricing models and identify the best pricing models

We compare the explanatory power and statistical significance of 26 pricing models formed from different combinations of pricing variables to settle on the pricing models that best explain Chinese equity returns from 2000 to 2009.

4) Perform out-of-sample testing using trading rules to verify the effectiveness of pricing models

We perform an out-of-sample test on the predictive power of the 26 pricing models in 2010. We devise and implement trading rules based on the different pricing models, and we subsequently compare the Sharpe ratios of the different strategies. The correlation between the R-squared of the pricing models and Sharpe ratios of the trading strategies for the out-of-sample period of 2010 will provide evidence for the effectiveness of modified pricing models in the Chinese equity market.

A. Examine the effectiveness of Fama-French Model in China

We start by duplicating the Fama-French method in China. We collect all the raw data we need from the China Stock Market & Accounting Research (CSMAR) database, which includes both trading and financial statement data of all listed Chinese companies since their IPOs. The database starts from the beginning of the Chinese stock market at the end of 1990. To ensure the compatibility of company data and as few missing values as possible, only stocks with STKCD (Chinese exchange codes) are part of the dataset. All necessary balance sheet data, e.g. total shareholders' equity, monthly returns data and trading data, e.g. monthly risk-free rates necessary for this exercise are extracted from the CSMAR. Stock data is collected from the period of 2000 to 2009. After initial extraction, data is subsequently tidied and scrubbed using the statistical program, R, to ensure compatibility on a cross-sectional basis as well as over the time series.

Stocks are allocated to two groups, small or large (S or L) based on whether their June market capitalization is below or above the median for all Chinese stocks on the Shanghai and Shenzhen exchanges, the 2 domestic stock exchanges in China. Market capitalization (ME) is calculated as stock price times shares outstanding. Stocks are also allocated in a separate sort to three book-to-market equity (BE/ME) groups, low medium or high (L, M, or H) based on breakpoints for the bottom 30 percent, middle 40 percent, and top 30 percent of the values of BE/ME for the Chinese stocks in our sample. Book equity is the stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (if available), minus the book value of preferred stock. ME is calculated as shown before. The BE/ME used to form portfolios in June of year t is book common equity for the fiscal year ending in calendar year t-1, divided by market equity at the end of December of t-1.

Our decision to sort firms into three groups on BE/ME and only two on size follows the evidence in Fama and French (1992) that book-to-market equity has a stronger role in average stock returns than size (Fama and French, 1992).

Rm and Rf monthly data are also tabulated alongside the aforementioned data. Rm is the value-weighted return on all Chinese stocks with STKCD codes and compatible returns, balance sheet and trading data, and it is calculated monthly. Rf is the risk-free rate in China, equivalent to the one-month Treasury bill rate in the U.S., and the data is aggregated and averaged for Chinese equity markets into monthly comparable risk-free rates.

Six benchmark portfolios (S/L, S/M, S/H, B/L, B/M and B/H) are formed as the intersections of the two size and the three BE/ME groups. For example, S/L is the portfolio of stocks that are below the median market capitalization and in the bottom 30 percent of BE/ME. Value-weighted returns on the 6 portfolios are calculated per month, and portfolios are rebalanced yearly to take into account the latest company data.

3 benchmark factors are then constructed to mimic the risk factors related to size, BE/ME and the market. SMB (Small Minus Big) is the difference between the equal-weight averages of the returns on the three small stock portfolios and the three big stock portfolios, constructed to be neutral with respect to BE/ME. This difference should be largely free of the influence of BE/ME, focusing instead on the different return behaviors of small and big stocks.

$SMB = (S/L + S/M + S/H)/3 – (B/L+B/M+B/H)/3$

Similarly, HML (High Minus Low) is the difference between the return on a portfolio of high BE/ME stocks and the return on a portfolio of low BE/ME stocks, constructed to be neutral with respect to size. Thus the difference between the two returns should be largely free of the size factor in returns, focusing instead on the different return behaviors of high and low BE/ME firms.

HML = (S/H+B/H)/2 – (S/L+B/L)/2

The correlation between SMB and HML for the January 2000 to December 2009 period is only -0.304. Thus, SMB indeed seems to provide a measure of the size premium that is relatively free of BE/ME effects, and HML is a measure of the BE/ME premium relatively free of size effects.

Finally, our proxy for the market factor in stock returns is the excess market return, Rm-Rf.

Appendix A shows the summary statistics for the 6 portfolios, SMB, HML and Rm-Rf for January 2000 to December 2008.

We then perform regressions of the 6 benchmark portfolios against the 3 benchmark factors according to the regression equation below. The regression results are summarized and analyzed under the empirical results section of this paper.

Ri -Rf = ai + bi (RM-Rf) + siSMB + hiHML + ei

B. Test the effectiveness of three additional pairs of China-specific pricing variables

In an effort to improve the explanatory power of the pricing model, we will incorporate 3 pairs of other risk factors which we feel best capture the unique characteristics of the Chinese market. These risk factors aim to model the momentum, herd mentality and degree of government control in the equity market. We seek to determine through regression if any of these factors when added to the Fama-French three-factor model are able to produce a pricing model of higher explanatory power, while at the same time making sure that the additional risk factors are statistically significant.

1) Momentum

A seminal paper by Jegadeesh and Titman documents consistent momentum trading profits in the U.S. from 1993 to 2001, which is remarkably similar to momentum profits found in earlier time periods (Jegadeesh and Titman, 2001). Their research provides assurance that momentum profits are not just due to data snooping biases and further suggest that, unlike what the efficient market hypothesis would imply, market participants have not altered their investment behavior to eliminate this source of return predictability.

Other literature has suggested that such momentum trading profits are observable in the Chinese market as well. A recent paper by Dongwei Su titled “An Empirical Analysis of Industry Momentum in Chinese Stock Markets” documents significant abnormal profits for industry momentum strategies in Chinese stock markets (Su, 2011). Another paper, titled “Trading volume and price pattern in China's stock market: a momentum life cycle explanation", found that China's stock market returns can be explained by the momentum life cycle theory, which suggests higher trading volume and returns for stocks that demonstrate high returns at an early stage (Sun and Zhu, 2011).

We propose three reasons why momentum trading is especially common in China. First, turnover in Chinese equity markets averages around 500% as aforementioned. This indicates short-term investment outlook by the retail investors who are the bulk of the investment community. Short-term investors tend to focus on historic short-term returns of stocks and invest in stocks which have had recent good performance. Second, retail investors in China are relatively unsophisticated compared to their counterparts in the U.S. because Chinese equity markets only appeared in the last 20 years, and it was only with the recent decade of tremendous growth in country GDP that a nascent middle class could afford to invest excess income on the stock markets. It is common for unsophisticated retail investors to trade on short-term trends. Third, due to the opaqueness of the Chinese market caused by unreliable accounting and managerial practices, fundamental analysis has its limits and is not likely to be trustworthy for the remaining sophisticated investors.

Given the above reasons for rampant momentum trading in China, and the past literature that suggests sustainable profits for momentum trading, we accordingly add a momentum risk variable to the regression model to try to improve the explanatory power of Chinese stock returns. This new benchmark factor is WML (winners minus losers), and it comes in two variants—WML2mth and WML1yr. The modified Fama-French pricing models are:

(i) Ri -Rf = ai + bi (RM-Rf) + siSMB + hiHML + miWML2mth + ei

(ii) Ri -Rf = ai + bi (RM-Rf) + siSMB + hiHML + miWML1yr + ei

We also test pricing models with momentum as the only pricing variable:

(iii) Ri -Rf = ai + miWML2mth + ei

(iv) Ri -Rf = ai + miWML1yr + ei

WML is the return on the highest prior cumulative return Fama-French portfolio minus the return on the lowest prior cumulative Fama-French return portfolio. The cumulative returns are geometric average cumulative returns over either a 2-month period (WML2mth) or 1-year period (WML1yr). The 2 month time frame is chosen assuming that the Chinese market has about 500% trading turnover, so portfolios are bought and sold at an average of every 2 months; we also examine WML for the 1 year time frame since it is popularly used by past research on this subject. We use the same 6 Fama-French portfolios (S/L, S/M, S/H, B/L, B/M, B/H) to ensure compatibility when we do multi-variable regression using different variables. They are rebalanced very year in June. Each month, the past 2-month and 1-year cumulative returns (excluding the current month) of the 6 Fama-French portfolios are computed and the 6 portfolios are ranked from the highest past cumulative return to the lowest past cumulative return. Current return on the highest prior cumulative return portfolio minus the current return on the lowest prior cumulative return portfolio gives the WML.

Regression results of the four regression equations are summarized and discussed under the section on empirical results.

2) *Herd Mentality*

The high turnover and past literature strongly point at the herd mentality of the Chinese retail investors. Due to the lack of sophistication, investors flock to buy the "popular" stocks which in turn become even more popular. We need a proxy for the popularity of stock as a reflection of this herd mentality. The idea is that popular stocks will generate higher returns at least in the short-term as the volume of trading on these stocks quickly increases. The factor we suggest incorporating into the pricing model is the value of shares traded in a month over the total market value of all tradable shares. This can be seen as a measure of turnover for individual stocks. We believe that in the short-term stocks with high turnovers will generate high trading volume and returns, and stocks with low turnovers will generate lower trading volume and returns. However, we also recognize a second possibility—stocks with the highest turnover may experience reduced trading volume and returns due to unsustainable high stock prices, while in comparison stocks with high but not the highest turnover may more likely experience continually increasing stock volume and returns. We incorporate these 2 separate possibilities into 2 risk factors—PtopMU (top most popular minus unpopular) and PmedMU (medium most popular minus unpopular).

In June every year, we separate Chinese stocks into three separate portfolios—top 30% stocks with the highest popularity as measured by the stock's individual turnover, middle 40% most popular stocks, and the least popular 30% of stocks. We use the same sample space of stocks used in the construction of the Fama-French portfolios to ensure compatibility. The portfolios are rebalanced every year in June. Every month, the value-weighted returns of the 3 portfolios are calculated. PtopMU is the monthly return of the portfolio with stocks of the top 30% turnover minus monthly return of stocks of the bottom 30% turnover. PmedMU is the monthly return of the portfolio with stocks of the medium 40% turnover minus monthly return of stocks of the bottom 30% turnover.

We compare 4 separate regression results, two with the Fama-French model plus the additional pricing variables, and the other two with pricing models solely based on PtopMU and PmedMU:

(i) Ri -Rf = ai + bi (RM-Rf) + siSMB + hiHML + piPtopMU + ei

(ii) Ri -Rf = ai + bi (RM-Rf) + siSMB + hiHML + piPmedMU + ei

(iii) Ri -Rf = ai + piPtopMU + ei

(iv) Ri -Rf = ai + piPmedMU + ei

The regression results are summarized and examined later under the empirical results section.

3) *Degree of Government Control*

A third variable that may account for variations in Chinese stock returns is the degree of government control of certain companies. Companies in which many shares are owned by the government and are not for trading may exhibit lower returns because they carry less risk of insolvency, or they may exhibit higher returns due to speculation of government interests that will have a major impact on these companies' performance.

We call the corresponding risk factor HGMLG (high government control minus low government control) and its value is the difference in monthly returns between the 30% of companies that have the highest government control and the 30% of companies that have the lowest government control. Amount of government control is measured by (1 - market value of tradable shares) divided by total equity market value of firm. In June of each year, we separate Chinese stocks into three portfolios—companies with the top 30% of government control, stocks with the middle 40% of government control, and stocks with the bottom 30% of government control. We use the same sample space of stocks used in the construction of the Fama-French portfolios to ensure compatibility. The portfolios are rebalanced every year in June. We calculate the value-weighted returns for the three portfolios every month and HGMLG is the difference between the returns of the highest 30% portfolio and the lowest 30% portfolio.

It is outside of the scope of this paper to examine whether it is high government controlled firms or whether it is low government controlled firms that have the higher returns. This is a more difficult endeavor because the opposite risk factor LGMHG (low government control minus high government control) is but the negative of HGMLG and the regression results of using either variable are the same. Rather, for this paper, we are more interested in the absolute difference between the monthly returns of high government controlled firms and that of low government controlled firms as an explanatory variable for Chinese equity market returns.

We also test another pricing variable—MGMLG (medium government control minus low government control) in the spirit of having 2 variants for the herd mentality pricing variable before. MGMLG is the difference in monthly returns between the 40% of companies that have the middle range of government control and the 30% of companies that have the lowest government control. MGMLG seeks to explain the variability of overall Chinese stock returns based on the absolute difference in returns on middle-government controlled firms and returns on low government-controlled firms.

We compare 4 separate regression results, two with the Fama-French model plus HGMLG or MGMLG, and the other two with pricing models solely based on HGMLG and MGMLG:

(i) $R_i - R_f = a_i + b_i (RM - R_f) + s_i SMB + h_i HML + g_i HGMLG + e_i$

(ii) $R_i - R_f = a_i + b_i (RM - R_f) + s_i SMB + h_i HML + g_i MGMLG + e_i$

(iii) $R_i - R_f = a_i + g_i HGMLG + e_i$

(iv) $R_i - R_f = a_i + g_i MGMLG + e_i$

The regression results are summarized and examined later under the empirical results section.

C. Determine the Best Pricing Model for Chinese Equity Market

After exploring the effectiveness of individual pricing variables, we now compare the R-squared and statistical significance of 26 pricing models which involve different combinations of the 6 pricing variables (WML2mth, WML1yr, PtopMU, PmedMU, HGMLG, MGLMG) together with the 3 Fama-French factors (SMB, HML, Rm-Rf). The dependent variables are the same 6 Fama-French portfolios that we have been using and the independent variables are the pricing variables. The 26 pricing models are ranked based on R-squared and statistical significance of the regressions.

A list of the 26 modified Fama-French pricing models, as well as the comparison of the R-squared and statistical significance of every regression, is displayed and examined later under the empirical results section.

D. Out-of-sample Test for Effectiveness of Pricing Models using Trading Rules

Finally, we want to examine if the pricing models with higher R-squared really generate better returns in the days ahead for trading strategies based on them. For this purpose, we calculate the R-squared for the 26 pricing models in the out-of-sample period of 2010 and compare them with the Sharpe ratios of trading strategies based on the 26 pricing models in 2010. The Sharpe ratios of the strategies are compared to one another and with the original Fama-French model. If the explanatory power of each pricing model we found is reliable, the Sharpe ratios of trading strategies should reflect the R-squared of the pricing models. Trading rules based on pricing models of higher R-squared should generate returns of higher Sharpe ratios. We shall examine if this is true under the last part of the empirical results section.

IV. Discussion of Empirical Results

A. Regression Results of Fama-French Three Factor Regression in China versus in U.S.

Fama and French (1992) showed that the three stock-market factors in combination capture strong common variation in stock returns. A three-factor regression done in the spirit of this paper but with 25 portfolios arranged by size and BE/ME (5x5) as the dependent variables shows that 21 of the 25 regressions yield R-squared values larger than 0.9 (Fama and French, 1992).

Fama and French also successfully proved their hypotheses that firms with high BE/ME should have positive slopes on HML (and vice versa) and that firms with small size should have positive slopes on SMB (and vice versa). We can understand this as follows: HML can be interpreted as the returns of a portfolio that longs high BE/ME stocks and shorts low BE/ME stocks, and SMB can be interpreted as the returns of a portfolio that longs low ME stocks and shorts high ME stocks. Thus, higher HML and SMB would imply that high BE/ME and small ME firms have higher returns respectively. Using the same three-factor regression of the 25 portfolios, Fama and French found that with few exceptions, the slopes on SMB decrease monotonically from smaller to bigger size company portfolios. Smaller firms have a larger size premium. Similarly, the HML slopes increase monotonically from strong negative values for the lowest BE/ME portfolio to strong positive values for the highest BE/ME portfolios, with few exceptions.

It is interesting to compare the above findings with the Fama-French model regression results for China. A summary of the regression results for China is shown below. Please refer to Appendix B for more detailed statistics.

S/L

Coefficients:	Estimate	Std. Error	t value	Pr(>|t|)
rm-rf	0.865172	0.032593	26.545	< 2e-16
smb	0.463559	0.09729	4.765	5.52E-06
hml	-1.39736	0.118561	-11.786	< 2e-16
Multiple R-squared: 0.89, Adjusted R-squared: 0.8871				

S/M

Coefficients:	Estimate	Std. Error	t value	Pr(>|t|)
rm-rf	-0.34109	0.06886	-4.953	2.51E-06
smb	-0.6716	0.20556	-3.267	0.001429
hml	0.99886	0.2505	3.987	1.17E-04
Multiple R-squared: 0.3641, Adjusted R-squared: 0.3476				

S/H

Coefficients:	Estimate	Std. Error	t value	Pr(>|t|)
rm-rf	0.889169	0.029493	30.149	< 2e-16
smb	0.629957	0.088036	7.156	8.09E-11
hml	-0.58662	0.107284	-5.468	2.65E-07
Multiple R-squared: 0.9061, Adjusted R-squared: 0.9037				

B/L

Coefficients:	Estimate	Std. Error	t value	Pr(>|t|)
rm-rf	0.86434	0.030488	28.35	< 2e-16
smb	-0.43828	0.091007	-4.816	4.47E-06
hml	-1.56464	0.110904	-14.108	< 2e-16
Multiple R-squared: 0.8869, Adjusted R-squared: 0.884				

B/M

Coefficients:				
Coefficients:	Estimate	Std. Error	t value	Pr(>|t|)
rm-rf	0.871064	0.036868	23.627	<2e-16
smb	-0.39534	0.11005	-3.592	0.000482

hml	-1.08045	0.134111	-8.056	7.79E-13
Multiple R-squared: 0.8339, Adjusted R-squared: 0.8296				

B/H

Coefficients:	Estimate	Std. Error	t value	Pr(>|t|)
rm-rf	0.840343	0.03405	24.679	<2e-16
smb	-0.60468	0.10164	-5.949	2.92E-08
hml	-0.37538	0.123863	-3.031	3.01E-03
Multiple R-squared: 0.8407, Adjusted R-squared: 0.8365				

The observations above are different from the Fama-French study in the U.S. in several key aspects:

1) The overwhelming number of regression R-squared values are at least 0.9 in the Fama-French study, and even the lowest is 0.83. For the Chinese market, this is only true for the S/H portfolio where the explanatory power of the Fama-French models is roughly equivalent in the 2 markets at around 0.9 R-squared. For the other 5 portfolios, the Fama-French model has lower explanatory power, with all but the S/M portfolio having R-squared between 0.8 and 0.9. The S/M portfolio has an R-squared of 0.3641. Hence in the Chinese market the three factors in combination do capture a large part of the variation in stock returns though less than that in the U.S. market. However, the S/M case shows that in the Chinese market this is not consistent.

Owing to the opaqueness of the equity market and the large proportion of domestic and retail investors, other risk factors need to be incorporated to better explain variations in Chinese stock returns.

2) Like the Fama-French study which shows that all 3 risk factors are all significant in explaining returns, in the Chinese market we observe that the excess market return, the value premium, HML, and the size premium, SMB, are also significant in explaining portfolio returns. For all 6 regressions, the slopes of 3 factors are significantly non-zero with high absolute t values and p-values far smaller than 0.05 (at 5% level of significance).

However, unlike the Fama-French study which indicates that all three risk factors are almost equally effective in capturing variation in stock returns, our observations seem to indicate that the size premium is the least effective of the three. The slopes of HML and Rm-Rf have in 4 out of 6 regressions higher t-values and lower p-values than slopes of SMB. Rm-Rf and HML also take turns having the highest slope of the three factors for all 6 regressions. SMB has the lowest slope in absolute value in 3 out of 6 regressions. The slope of SMB and its statistical significance pale in comparison to the other 2 factors. Hence it appears that unlike in the U.S. market, in the Chinese market the value premium and market risk premium are more dominant factors in explaining stock return variations than the size premium.

This implies that in the Chinese market, small companies do not bear as much risk as in the U.S. market. It is likely that due to high level of government regulation and high government interests in domestic corporations, smaller companies have less risk in raising sufficient capital or of insolvency compared to their counterparts in the U.S. Government incentives to companies in China, which likely does not discriminate against size, helps in balancing the playing field. Investors thus are likely to have more confidence in smaller firms in China than they would in the U.S, and the size premium does not have an equally large effect in China as in the U.S.

This suggests that other risk factors should be incorporated into the pricing model to make up for the inability of the size premium to explain as much variation of returns as in U.S. markets. The three factors are not as equally effective in "spanning the dimensions" of the Chinese market as of the U.S. market.

3) In the Chinese market, where the slope of the size factor is significantly non-zero, the slope of SMB in most cases decreases from smaller to bigger size company portfolios, like what the Fama-French study suggests. We see from our study that the coefficient for SMB decreases from 0.46 in the S/L portfolio to -0.44 in the B/L portfolio, and from 0.63 in the S/H portfolio to -0.61 in the B/H portfolio. However, this is not a consistent relationship. The slope of SMB increases from -0.67 in the S/M portfolio to -0.40 in the B/M portfolio instead of decreases.

Similarly, we observe that in most cases high BE/ME company portfolios have higher HML coefficients than low BE/ME company portfolios, like what the Fama-French study suggests. For example, the slope of HML decreases from -0.38 for B/H to -1.08 for B/M and then to -1.56 for B/L. But this, like in the case of SMB, is not consistent. HML coefficient increases instead of decreases from -0.59 in S/H to 1.00 in S/M.

The above exceptions suggest that for the Chinese market sometimes high BE/ME firms have worse returns than low BE/ME firms when HML increases, and sometimes small firms have worse returns than big firms when SMB increases. The latter has been explained before in that government incentives and control help to level the playing field to a certain extent and make small firms not as unattractive as they otherwise are and vice versa.

As for the former, it is an interesting observation that high BE/ME firms can have lower returns than small BE/ME firms despite high BE/ME firms having more risk; this may be the result of two possible reasons. First, the high number of retail investors and high turnover of stocks in the Chinese market suggests a short-term view of the market. Retail investors prefer to invest in growth stocks which have a proven track record (low BE/ME firms) rather than value stocks (high BE/ME firms) which look unattractive to short-term investors. Another important reason may be that the retail investors are (rightfully) suspicious of the corporate governance, accounting standards and insider trading in Chinese equity markets, such that low BE/ME firms appear to be much safer investments than high BE/ME firms whose executive suite seem unable to raise market value despite their considerable manipulative potential.

In summary, the observations show that the market risk premium, size premium and value premium are less effective and consistent in explaining stock return variations in China than in the U.S. Specifically, in China the size premium is not always as significant a factor as the value and market risk premium in explaining returns. In addition, even though in China, like in the U.S., the value premium is generally proportional to BE/ME and size premium generally inversely proportional to size, sometimes they behave in the opposite way, i.e. instead of high BE/ME firms and small-size firms corresponding to high HML coefficient and high SMB coefficient respectively like in the U.S., we sometimes see the opposite relation happening in China. All these observations suggest that additional risk factors need to be examined in combination with the three Fama-French factors to better understand variation of stock returns in China.

B. Regression Results for Modified Chinese Pricing Models

1) Regression Results of Fama-French Model and Momentum Factor

Pricing models	**R-squared**	**Statistical significance of pricing variables**
FM + WML1yr	Increase by 1.1%	Insignificant for all 6 portfolios
FM + WML2mth	Increase by 0.5%	Insignificant for all 6 portfolios
WML1yr	0.003	Insignificant for all 6 portfolios
WML2mth	0.04	Insignificant for all 6 portfolios

Note: FM stands for Fama-French model. Increase by 1.1% and by 0.5% are with reference to the basic Fama-French three-factor model.

For FM + WML1yr, on average the 6 portfolios have higher R-squared and lower p-value than for FM + WML2mth. This suggests that using WML with longer-time-frame cumulative returns in combination with the three Fama-French factors allows for better results compared to using WML with shorter-time-frame cumulative returns in combination with the Fama-French factors.

Interestingly, although the 1-yr WML gives a more statistically significant result and higher explanatory power when used alongside the Fama-French factors in the pricing model, when used as the only pricing variable, it is the 2-mth WML that produces far better results. WML2mth has higher average R-squared compared to WML 1yr.

Please refer to Appendix C1, C2, C3 and C4 for more detailed regression results of FM + WML2mth, FM + WML1yr, WML2mth and WML1yr respectively.

2) Regression Results of Fama-French Model and Herd Mentality Factor

Pricing models	**R-squared**	**Statistical significance of pricing variables**
FM + PtopMU	Increase by 0.9%	Significant for all 6 portfolios other than S/L and B/H
FM + PmedMU	Increase by 1.4%	Significant for all 6 portfolios
PtopMU	0.25 other than B/H	Significant for all 6 portfolios
PmedMU	0.21 other than B/H	Significant for all 6 portfolios

Interestingly, we observe that while the PmedMU used in combination with the Fama-French factors gives better explanatory results than when PtopMU is used in combination with the Fama-French factors, it is PtopMU that gives better explanatory results than PmedMU when it is used as the only regression variable. This opposite result was previously also observed for the 2-mth WML and 1-yr WML variables.

Please refer to Appendix D1, D2, D3 and D4 for more detailed regression results of FM + PtopMU, FM + PmedMU, PtopMU and PmedMU respectively.

3) Regression Results of Fama-French Model and Government Control Factor

Pricing models	**R-squared**	**Statistical significance of pricing variables**
FM + HGMLG	Increase by 1%	Significant for all 6 portfolios other than S/M
FM + MGMLG	Increase by 0.2%	Significant only for B/H and S/L
HGMLG	0.067	Significant for all 6 portfolios other than S/M
MGMLG	0.057	Significant for all 6 portfolios other than S/M and B/H

It seems that the HGMLG factor is a better explanatory variable than MGLMG no matter whether these factors are used as the only pricing variables, or whether they are used in conjunction with the Fama-French three factors. HGMLG is more explanatory and statistically significant than the MGMLG factor in general.

Please refer to Appendix E1, E2, E3 and E4 for more detailed regression results of FM + HGMLG, FM + MGMLG, HGMLG and MGMLG respectively.

4) Summary of General Observations

The 3 pairs of additional risk factors have varying degrees of effectiveness in explaining stock variations. It would seem that the herd mentality factors (PtopMU and PmedMU) are the most effective pair of pricing variables, followed by the degree of government control factors (HGMLG and MGMLG), then by momentum factors (WML1yr and WML2mth). Momentum factors are the least effective pricing variables. They not only generate the lowest R-squared for the 6 Fama-French portfolios, but also are statistically insignificant in all the regressions they are in.

Another interesting observation is that the two variables within each pair can have different relative effectiveness depending on whether they are variables alongside the Fama-French three-factor model or whether they are the only variables in the pricing models. Specifically, WML2mth and PtopMU have higher explanatory power than WML1yr and PmedMU respectively when they are the only pricing variables in the pricing models, but when WML1yr and PmedMU are added to the Fama-French model, the resulting four-factor models have higher explanatory power than when WML2mth and PtopMU are added to the Fama-French model. On the other hand, HGMLG seems to be the more effective pricing variable no matter whether it is the only pricing variable in the pricing model, or whether it is a factor alongside the Fama-French factors in a four-factor model.

C. Evaluation of Pricing Models for Chinese Equity Market

We test the following 26 modified Fama-French models based on a combination of the Fama-French model (FM) and the 6 additional pricing factors (WML1yr, WML2mth, PtopMU, PmedMU, HGMLG, MGMLG). We examine the R-squared of the regressions and rank them in terms of their explanatory power.

(1) FM + WML1yr

(2) FM + WML2mth

(3) FM + PtopMU

(4) FM + PmedMU

(5) FM + HGMLG

(6) FM + MGMLG

(7) FM + WML1yr + PtopMU

(8) FM + WML1yr + PmedMU

(9) FM + WML1yr + HGMLG

(10) FM + WML1yr + MGMLG

(11) FM + WML2mth + PtopMU

(12) FM + WML2mth + PmedMU

(13) FM + WML2mth + HGMLG

(14) FM + WML2mth + MGMLG

(15) FM + PtopMU + HGMLG

(16) FM + PtopMU + MGMLG

(17) FM + PmedMU + HGMLG

(18) FM + PmedMU + MGMLG

(19) FM + WML1yr + PtopMU + HGMLG

(20) FM + WML1yr + PtopMU + MGLMG

(21) FM + WML1yr + PmedMU + HGMLG

(22) FM + WML1yr + PmedMU + MGLMG

(23) FM + WML2mth + PtopMU + HGMLG

(24) FM + WML2mth + PtopMU + MGLMG

(25) FM + WML2mth + PmedMU + HGMLG

(26) FM + WML2mth + PmedMU + MGLMG

A complete ranking of the R-squared and statistical significance for all 26 regressions is shown in Appendix F1 and F2. The tables below show the R-squared and statistical significance of the top 5 and bottom 5 models.

Regressions	**R-squared for 6 Fama-French portfolios**						
	S/L	**S/M**	**S/H**	**B/L**	**B/M**	**B/H**	**Average**
FM + WML1yr + PmedMU + HGMLG	0.924	0.422	0.936	0.917	0.885	0.890	**0.829**
FM + WML1yr + PtopMU + HGMLG	0.918	0.430	0.929	0.909	0.872	0.883	**0.824**
FM + WML2mth + PmedMU + HGMLG	0.919	0.415	0.926	0.905	0.872	0.884	**0.820**
FM + WML1yr + PmedMU + MGLMG	0.911	0.420	0.931	0.910	0.869	0.871	**0.819**
FM + PmedMU + HGMLG	0.919	0.406	0.926	0.905	0.872	0.884	**0.819**
Middle 16 regressions							
FM + WML1yr	0.900	0.378	0.919	0.895	0.850	0.854	**0.799**
FM + PtopMU	0.891	0.409	0.913	0.887	0.843	0.847	**0.798**
FM + WML2mth +	0.897	0.370	0.909	0.883	0.838	0.854	**0.792**

MGMLG							
FM + MGMLG	0.897	0.363	0.909	0.883	0.837	0.854	**0.791**
FM + WML2mth	0.894	0.369	0.909	0.883	0.837	0.847	**0.790**

Regressions	**Number of Fama-French portfolios at which a pricing variable is significant at the 5% level of significance**									
	beta	**SMB**	**HML**	**WML1yr**	**WML2mth**	**PtopMU**	**PmedMU**	**HGMLG**	**MGMLG**	**Average**
FM + PmedMU	6	6	6	N/A	N/A	N/A	6	N/A	N/A	**6.00**
FM + HGMLG	6	6	6	N/A	N/A	N/A	N/A	5	N/A	**5.75**
FM + PmedMU + HGMLG	6	5	6	N/A	N/A	N/A	6	5	N/A	**5.60**
FM + PtopMU + HGMLG	6	6	6	N/A	N/A	4	N/A	5	N/A	**5.40**
FM + PtopMU	6	6	5	N/A	N/A	4	N/A	N/A	N/A	**5.25**
Middle 16 regressions										
FM + WML1yr + PmedMU + MGLMG	6	4	6	0	N/A	N/A	6	N/A	2	**4.00**
FM + WML2mth + PtopMU + MGLMG	6	6	6	N/A	0	4	N/A	N/A	2	**4.00**
FM + WML2mth + PmedMU + MGLMG	6	4	6	N/A	0	N/A	6	N/A	2	**4.00**
FM + WML1yr + MGMLG	6	6	6	0	N/A	N/A	N/A	N/A	1	**3.80**
FM + WML1yr + PtopMU + MGLMG	6	4	6	0	N/A	4	N/A	N/A	2	**3.67**

The results show that there is a tradeoff between the R-squared of the regression and the statistical significance of the pricing variables. We observe that the pricing models which have a larger number of pricing variables have higher R-squared but a lower average statistical significance of the individual pricing variables, and vice versa.

Also, the results echo the earlier finding that the variables WML1yr, PmedMU and HGMLG produce better results (both higher R-squared for regression and more statistically significant pricing variables) when used in combination with the Fama-French factor as opposed to the variables WML2mth, PtopMU and MGMLG. In addition, we observe the interesting fact that the statistical significance of individual pricing variables, as determined in the previous section, do not change much as other variables are added into the regression formulae. WML1yr and WML2mth are not statistically significantly at all for the regressions they are in. At the other extreme is PmedMU, which is statistically significant for all the regressions they are in. There seems to be a largely fixed statistical significance of the pricing variables that is independent of the other pricing variables they are paired up with. From the highest to the lowest statistical significance, we have the Fama-French factors, PmedMU, HGMLG, PtopMU, MGMLG, followed by WML1yr and WML2mth as joint last.

Let us now turn to the explanatory power of the 26 pricing models. The R-squared for the top pricing model is 0.83 and the R-squared for the bottom pricing model is 0.79. There is only a range of 0.04. We can conclude based on this that the factors of momentum, herd mentality and degree of government control, or at least the way I measure them, do not add significantly higher explanatory power on top of the basic Fama-French model. The R-squared for a basic Fama-

French model in the Chinese equity market is 0.787, which is only marginally smaller than the R-squared of all the pricing models above. In addition, as more variables are added into the pricing model, their statistical significance start to decrease and only the Fama-French factors (alongside PmedMU) remain largely significant throughout. This reinforces the idea that the 3 Fama-French factors (beta, HML and SMB) explain the majority of stock returns variation in the Chinese market (up to about 78.7%) reliably, with the other pricing variables adding incremental explanatory power at best on a less reliable basis. However, on the other hand, since all 26 modified Fama-French pricing models have higher R-squared than the three-factor Fama-French pricing model, it can be argued that adding the variables of momentum, herd mentality and degree of government control do provide a confirmed improvement to the explanatory power of the basic Fama-French model, though it may be small.

D. Results of Out-of-sample Trading Rules Tests

In the earlier section, there are 9 pricing variables in total that are recombined to form different pricing models (the 3 Fama-French variables SMB, HML and Rm-Rf, WML2mth, WML1yr, PtopMU, PmedMU, HGMLG, MGLMG). In order to test the effectiveness of regression models that incorporate these factors, we can think of each factor as a long-short trading rule or strategy. For example, SMB is a strategy that longs the 30% of stocks with the lowest market capitalization and shorts the 30% of stocks with the highest market capitalization. The trading rule associated with each pricing variable is summarized in the table below.

Pricing Variable	**Trading Rule**
SMB	Long 30% of stocks with highest market capitalization and short 30% of stocks with lowest market capitalization
HML	Long 30% of stocks with the highest book equity to market equity (BE/ME) and short 30% of stocks with the lowest book equity to market equity (BE/ME)
Rm-Rf	Long the market portfolio of all stocks with STKCD numbers and short the risk-free portfolio consisting of 10-year Chinese Treasury bills
WML2mth	Long 30% of stocks with highest prior 2-month geometric average return and short 30% of stocks with lowest prior 2-month geometric average return
WML1yr	Long 30% of stocks with highest prior 1-year geometric average return and short 30% of stocks with lowest prior 1-year geometric average return
PtopMU	Long 30% of stocks with highest popularity /

	stock turnover and short 30% of stocks with lowest popularity / stock turnover
PmedMU	Long 40% of stocks with medium popularity / stock turnover and short 30% of stocks with lowest popularity / stock turnover
HGMLG	Long 30% of stocks with highest degree of government control and short 30% of stocks with lowest degree of government control
MGLMG	Long 40% of stocks with medium degree of government control and short 30% of stocks with lowest degree of government control

As the table above shows, every trading strategy consists of longing a portfolio of stocks with specific characteristics and shorting a portfolio of stocks with the opposite characteristics. We arrange all Chinese stocks with STKCD numbers as of December 2009 into the different portfolios and calculate the monthly returns for each trading strategy, as shown below.

Dates	**Trading Strategy 1 returns (SMB)**	**Trading Strategy 2 returns (HML)**	**Trading Strategy 3 returns (Rm-Rf)**	**Trading Strategy 4 returns (WML2mth)**	**Trading Strategy 5 returns (WML1yr)**	**Trading Strategy 6 returns (PtopMU)**	**Trading Strategy 7 returns (PmedMU)**	**Trading Strategy 8 returns (HGMLG)**	**Trading Strategy 9 returns (MGMLG)**
2010/01	0.0591	-0.0164	-0.0648	0.0401	0.0305	0.0379	0.0463	-0.0060	0.0112
2010/02	0.0431	-0.0223	0.0336	0.0490	0.0327	0.0414	0.0316	-0.0137	0.0055
2010/03	0.0352	0.0030	0.0240	0.0663	0.0335	0.0271	0.0024	-0.0083	0.0025
2010/04	0.0012	-0.0271	-0.0404	0.0407	0.0295	-0.0104	0.0048	-0.0014	0.0038
2010/05	-0.0043	0.0004	-0.1064	0.0252	0.0282	-0.0046	-0.0157	0.0155	-0.0033
2010/06	-0.0052	0.0285	-0.0250	0.0038	0.0210	-0.0133	-0.0315	-0.0118	-0.0123
2010/07	0.0204	-0.0265	0.1349	0.0215	0.0278	0.0354	0.0310	-0.0078	0.0234
2010/08	0.0745	-0.0721	0.0534	0.0055	0.0307	0.0731	0.0663	-0.0453	0.0026
2010/09	0.0023	-0.0319	0.0394	0.0790	0.0379	-0.0021	0.0159	-0.0092	-0.0156
2010/10	-0.0497	0.0014	0.1181	0.0788	0.0401	-0.0136	0.0038	-0.0171	0.0111
2010/11	0.0668	-0.0348	-0.0233	0.0397	0.0340	0.0389	0.0293	0.0114	-0.0019
2010/12	-0.0030	0.0203	0.0028	0.0218	0.0356	-0.0067	-0.0083	-0.0163	-0.0103

Every pricing model can be seen as a combination of different trading strategies. For example, the pricing model FM + WML1yr + PmedMU + HGMLG can be seen as an investment into seven trading strategies since there are 7 pricing variables (SML, HML, Rm-Rf, WML1yr, PmedMU, HGMLG). Let us assume that an equal amount of money is invested into each strategy. The monthly return of executing that pricing model in the market is hence the simple average of the monthly returns of each trading strategy.

The monthly return of all 26 pricing models is shown in Appendices G1 to G5. A sample of that, illustrating the monthly returns of 4 select pricing models, is shown below:

Dates	**FM + WML1yr + PmedMU + HGMLG**	**FM + WML1yr + PtopMU + HGMLG**	**FM + WML2mth + PmedMU + HGMLG**	**FM + WML1yr + PmedMU + MGLMG**
2010/01	0.008123716	0.006722899	0.009731222	0.01097673
2010/02	0.017497787	0.019131369	0.020200662	0.020699853
2010/03	0.014981252	0.019091336	0.02044601	0.016784342
2010/04	-0.005562189	-0.008100765	-0.003682492	-0.004701683
2010/05	-0.013725625	-0.01186502	-0.014223173	-0.016846595
2010/06	-0.004003827	-0.000976482	-0.006883383	-0.004086025
2010/07	0.029976543	0.030708944	0.02892534	0.035162219
2010/08	0.017917837	0.019043515	0.013704459	0.025900783
2010/09	0.009069091	0.006068253	0.015918201	0.008011176
2010/10	0.016095429	0.01319316	0.022530774	0.020806517
2010/11	0.013902116	0.015511748	0.014851292	0.011676807
2010/12	0.005196202	0.005453093	0.002891528	0.006194788

We go on to calculate the Sharpe ratio for each pricing model and compare them with the R-squared of the pricing models. The results are shown below, in descending order of R-squared:

Trading rules	R-squared	Sharpe ratio
FM + WML1yr + PmedMU + HGMLG	0.829	0.753
FM + WML1yr + PtopMU + HGMLG	0.824	0.767
FM + WML2mth + PmedMU + HGMLG	0.820	0.787
FM + WML1yr + PmedMU + MGLMG	0.819	0.751
FM + PmedMU + HGMLG	0.819	0.323
FM + WML1yr + PmedMU	0.815	0.793
FM + WML2mth + PtopMU + HGMLG	0.815	0.817
FM + WML1yr + PtopMU + MGLMG	0.814	0.767
FM + PtopMU + HGMLG	0.813	0.344
FM + WML1yr + HGMLG	0.811	0.680
FM + WML1yr + PtopMU	0.810	0.808
FM + WML2mth + PmedMU + MGLMG	0.809	0.794
FM + PmedMU + MGMLG	0.807	0.392
FM + WML2mth + PmedMU	0.805	0.835
FM + WML2mth + PtopMU + MGLMG	0.803	0.822
FM + PmedMU	0.803	0.406
FM + WML2mth + HGMLG	0.802	0.708
FM + PtopMU + MGMLG	0.802	0.411
FM + WML1yr + MGMLG	0.801	0.709
FM + HGMLG	0.801	0.144
FM + WML2mth + PtopMU	0.800	0.864
FM + WML1yr	0.799	0.749
FM + PtopMU	0.798	0.425
FM + WML2mth + MGMLG	0.792	0.750
FM + MGMLG	0.791	0.269
FM + WML2mth	0.790	0.786

The Sharpe ratio of the basic three-factor Fama-French three-factor model is 0.271, which is lower than all but 2 of the above models. This supports the earlier observation that the modified pricing models have higher explanatory power / R-squared than the basic Fama-French three-factor model.

We also observe that the correlation between the Sharpe ratio and the R-squared is a weak positive correlation of 0.2 and that the interquartile range of the Sharpe ratios is about 0.3. This is compatible with the observations of the pricing models' R-squared that we made earlier. Since it was shown earlier that the modified pricing models generate R-squared which are very close to each other, it follows that the returns they generate in actual trading should have a small interquartile range, and the 0.3 interquartile range observed confirms that. Also, since the R-squared of the modified Fama-French pricing models are so similar, it should be hard to predict the performance of the models in actual trading. Hence the weak correlation of 0.2 between R-squared and Sharpe ratios is not surprising.

V. Conclusion

Let us conclude the research results for our four areas of interest separately. Regarding the effectiveness of the Fama-French model in China, we conclude that the basic three-factor Fama-French model is highly successful in explaining stock market returns in China. It can explain at least 80% of variations in Chinese stock returns with the exception of the S/M portfolio which has an R-squared of 0.3641. In comparison, a similar Fama-French study conducted in the U.S. shows R-squared values of at least 0.9 for most Fama-French portfolios. Even the lowest R-squared is 0.83. Hence in the Chinese market the three factors in combination capture a smaller part of the variation in stock returns than in the U.S. market. Also, the S/M case shows that in the Chinese market the effectiveness of the Fama-French model is not consistent across all stocks.

Another two key differences between the Fama-French model results in China and in the U.S can be made. First, unlike in the U.S. market where all three variables—Rm-Rf, SMB and HML--are almost equally effective, in China the size premium is not always as significant a factor as the value and market risk premium in explaining returns. In addition, even though in China, like in the U.S., the value premium is generally proportional to BE/ME and size premium generally inversely proportional to size, sometimes they behave in the opposite way, i.e. instead of high BE/ME firms and small-size firms corresponding to high HML coefficient and high SMB coefficient respectively like in the U.S., we sometimes see the opposite relation happening in China. All these observations suggest that additional risk factors need to be examined in combination with the three Fama-French factors to better understand variation of stock returns in China.

Moving on to the effectiveness of the three additional pairs of China-specific pricing variables (momentum, herd mentality and degree of government control), past literature indicates that they are important risk factors for the Chinese equity market. However, my results do not support that to a large extent. These 3 pairs of additional risk factors have varying degrees of effectiveness in explaining stock variations. It would seem that the herd mentality factors (PtopMU and PmedMU) are the most effective pair of pricing variables, followed by the degree of government control factors (HGMLG and MGMLG), then by momentum factors (WML1yr and WML2mth). Momentum factors are the least effective pricing variables. They not only generate the lowest R-squared for the 6 Fama-French portfolios, but also are statistically insignificant in all the regressions they are in.

Another interesting observation is that the two variables within each pair can have different relative effectiveness depending on whether they are variables alongside the Fama-French three-factor model or whether they are the only variables in the pricing models. Specifically, WML2mth and PtopMU have higher explanatory power than WML1yr and PmedMU respectively when they are the only pricing variables in the pricing models, but when WML1yr and PmedMU are added to the Fama-French model, the resulting four-factor models have higher explanatory power than when WML2mth and PtopMU are added to the Fama-French model. On the other hand, HGMLG seems to be the more effective pricing variable no matter whether it is the only pricing variable in the pricing model, or whether it is a factor alongside the Fama-French factors in a four-factor model.

Our third area of interest is to compare the relative explanatory power of 26 pricing models that consist of a combination of Fama-French factors and the additional 3 pairs of China-specific pricing variables. We observe that the addition of the China-specific variables do allow for higher explanatory power than the original three-factor model, but only by a little. The best pricing model has a R-squared of 0.83 compared to the R-squared of the Fama-French three-factor model at about 0.79. The difference in R-squared between different models is small and there is no one model that is significantly better than the rest. Also, the statistical significance of the additional risk variables is generally less than that of the Fama-French three-factor factor model, with the exception of PmedMU which is statistically significant in all pricing models that incorporate it.

Finally, for the out-of-sample test in the year 2010 using trading rules, we observe that the Sharpe ratio of the basic three-factor Fama-French three-factor model is 0.271, which is lower than all but 2 of the 26 pricing models. This supports the earlier observation that the modified pricing models have higher explanatory power / R-squared than the basic Fama-French three-factor model. Also, we observe that the correlation between the Sharpe ratio and the R-squared is a weak positive correlation of 0.2 and that the interquartile range of the Sharpe ratios is only about 0.3. Since the R-squared of the modified Fama-French pricing models are so similar, it is understandable that the Sharpe ratios are also close to each other, and that it is hard to predict the performance of the models in actual trading.

VI. Bibliography

Balsara, Nauzer J., Chen, Gary, and Zheng, Lin. "The Chinese Stock Market: An Examination of the Random Walk Model and Technical Trading Rules" *Quarterly Journal of Business and Economics* 46.2 (2007): 43-63. Print.

Coutts, J. Andrew, and Kwong-C. Cheung. "Trading Rules and Stock Returns: Some Preliminary Short Run Evidence from the Hang Seng 1985-1997." *Applied Financial Economics* 10.6 (2000): 579-86. Print.

Daniel, Kent, and Titman, Sheridan. " Evidence on the Characteristics of Cross Sectional Variation in Stock Returns" *Journal of Finance, American Finance Association* 52.1 (1997): 1-33. Print.

Davis, James L., Eugene F. Fama, and Kenneth R. French. "Characteristics, Covariances and Average Returns: 1929-1997." *Journal of Finance* 55 (2000): 389-406. Print.

Eun, C., and W. Huang. "Asset Pricing in China's Domestic Stock Markets: Is There a Logic?" *Pacific-Basin Finance Journal* 15.5 (2007): 452-80. Print.

Fama, Eugene F., and Kenneth R. French. "Common Risk Factors in the Returns on Stocks and Bonds." *Journal of Financial Economics* 33.1 (1993): 329-370. Print.

Jegadeesh, Narasimhan, and Sheridan Titman. "Profitability of Momentum Strategies: An Evaluation of Alternative Explanations." *The Journal of Finance* 56.2 (2001): 699-720. Print.

Su, Dongwei. "An Empirical Analysis Of Industry Momentum In Chinese Stock Markets." *Emerging Markets Finance and Trade* 47.4 (2011): 4-27. Print.

Sun, Qian, and Zhu, Xiaotian. "Trading volume and price pattern in China's stock market: a momentum life cycle explanation." *Journal of Behavioral Studies in Business* 4 (2011): 1. Print.

Wang, Fenghua, and Yexiao Xu. "What Determines Chinese Stock Returns?" *Financial Analysts Journal* 60.6 (2004): 65-77. Print.

VII. Appendix

Appendix A

Dates	S/L	S/M	S/H	B/L	B/M	B/H	SMB	HML	Rm	Rf
2000/01	0.142	0.086	0.037	0.284	0.183	0.104	-0.102	-0.143	0.097	0.186
2000/02	0.154	0.109	0.061	0.185	0.119	0.099	-0.027	-0.089	0.033	0.186
2000/03	0.143	0.112	0.119	0.072	0.058	0.077	0.056	-0.010	0.076	0.186
2000/04	-0.007	0.013	0.057	-0.017	0.005	-0.008	0.027	0.037	0.006	0.186
2000/05	0.050	0.042	0.115	0.041	0.028	0.042	0.032	0.033	0.141	0.186
2000/06	0.001	0.019	0.029	0.019	0.041	0.063	-0.025	0.036	0.071	0.186
2000/07	0.062	0.077	0.128	0.060	0.077	0.066	0.022	0.036	0.060	0.186
2000/08	0.044	0.021	0.017	-0.007	-0.014	-0.024	0.043	-0.022	0.024	0.186
2000/09	-0.009	-0.029	-0.073	-0.041	-0.058	-0.063	0.017	-0.043	-0.061	0.186
2000/10	0.035	0.059	0.072	-0.003	0.025	0.024	0.040	0.032	0.061	0.186
2000/11	0.058	0.066	0.072	0.040	0.056	0.067	0.011	0.021	0.055	0.186
2000/12	-0.008	0.013	0.057	-0.017	0.005	-0.008	0.027	0.037	0.088	0.186
2001/01	-0.028	-0.016	-0.003	-0.011	-0.006	0.014	-0.014	0.025	-0.018	0.186
2001/02	-0.092	-0.064	-0.043	-0.053	-0.056	-0.034	-0.019	0.034	-0.004	0.186
2001/03	0.146	0.093	0.303	0.087	0.074	0.137	0.081	0.103	0.585	0.186
2001/04	0.030	0.004	0.026	0.020	-0.016	-0.024	0.027	-0.024	0.071	0.186
2001/05	0.095	0.077	0.101	0.036	0.026	0.022	0.063	-0.004	0.125	0.186
2001/06	0.004	0.010	-0.009	0.002	0.004	0.001	-0.001	-0.007	-0.039	0.186
2001/07	-0.131	-0.138	-0.158	-0.120	-0.139	-0.137	-0.010	-0.022	-0.189	0.186
2001/08	-0.006	-0.029	-0.020	-0.043	-0.033	-0.044	0.022	-0.007	-0.026	0.186
2001/09	-0.099	-0.063	-0.071	-0.066	-0.038	-0.032	-0.033	0.031	-0.064	0.186
2001/10	-0.067	-0.059	-0.031	-0.050	-0.049	-0.021	-0.012	0.032	-0.007	0.186
2001/11	0.064	0.062	0.054	0.017	0.045	0.042	0.025	0.007	0.047	0.186
2001/12	-0.106	-0.062	-0.052	-0.073	-0.055	-0.048	-0.015	0.039	-0.023	0.186
2002/01	-0.153	-0.140	-0.156	-0.090	-0.091	-0.085	-0.061	0.001	-0.149	0.186
2002/02	0.062	0.034	0.033	0.026	0.025	0.024	0.018	-0.015	0.030	0.164
2002/03	0.099	0.080	0.075	0.091	0.058	0.047	0.019	-0.035	0.057	0.164
2002/04	0.068	0.052	0.046	0.029	0.037	0.045	0.018	-0.002	0.008	0.164
2002/05	-0.075	-0.095	-0.097	-0.061	-0.090	-0.085	-0.010	-0.023	-0.064	0.164
2002/06	0.082	0.101	0.118	0.142	0.147	0.164	-0.051	0.029	0.136	0.164
2002/07	-0.028	-0.036	-0.024	-0.028	-0.049	-0.045	0.011	-0.007	-0.011	0.164
2002/08	0.007	0.012	0.012	0.005	-0.001	0.012	0.005	0.006	0.009	0.164
2002/09	-0.070	-0.057	-0.046	-0.053	-0.059	-0.057	-0.002	0.010	-0.051	0.164
2002/10	-0.054	-0.066	-0.071	-0.041	-0.051	-0.054	-0.015	-0.015	-0.084	0.164

2002/11	-0.091	-0.089	-0.079	-0.059	-0.060	-0.047	-0.031	0.012	-0.060	0.164
2002/12	-0.028	-0.051	-0.052	-0.043	-0.057	-0.055	0.008	-0.018	-0.048	0.164
2003/01	0.106	0.111	0.107	0.077	0.108	0.107	0.011	0.015	0.107	0.164
2003/02	0.018	0.023	0.009	0.012	0.004	0.009	0.008	-0.006	-0.002	0.164
2003/03	-0.032	-0.043	-0.035	-0.003	0.010	0.000	-0.039	0.000	-0.016	0.164
2003/04	-0.081	-0.068	-0.068	0.014	0.030	0.022	-0.094	0.010	-0.001	0.164
2003/05	0.035	0.032	0.032	0.053	0.051	0.054	-0.020	-0.001	0.040	0.164
2003/06	-0.056	-0.071	-0.065	-0.052	-0.074	-0.056	-0.004	-0.006	-0.053	0.164
2003/07	-0.037	-0.045	-0.032	-0.008	-0.007	0.011	-0.037	0.013	0.031	0.164
2003/08	-0.018	-0.025	-0.028	-0.028	-0.036	-0.036	0.010	-0.009	-0.045	0.164
2003/09	-0.055	-0.048	-0.039	-0.041	-0.048	-0.034	-0.006	0.012	-0.021	0.164
2003/10	-0.100	-0.079	-0.060	-0.060	-0.027	0.021	-0.058	0.060	0.047	0.164
2003/11	-0.008	0.018	0.025	0.006	0.029	0.046	-0.015	0.037	0.026	0.164
2003/12	-0.062	-0.023	-0.017	-0.002	0.030	0.066	-0.066	0.057	0.019	0.164
2004/01	0.095	0.093	0.081	0.088	0.087	0.077	0.006	-0.012	0.072	0.164
2004/02	0.124	0.096	0.096	0.091	0.089	0.056	0.027	-0.031	0.051	0.164
2004/03	0.051	0.043	0.040	0.040	0.043	0.033	0.006	-0.010	0.012	0.164
2004/04	-0.124	-0.106	-0.109	-0.087	-0.092	-0.079	-0.027	0.011	-0.101	0.164
2004/05	-0.007	-0.011	-0.019	-0.019	-0.023	-0.017	0.008	-0.005	-0.010	0.164
2004/06	-0.136	-0.137	-0.136	-0.122	-0.115	-0.089	-0.028	0.017	-0.086	0.164
2004/07	-0.047	-0.040	-0.027	-0.009	0.007	0.010	-0.040	0.020	0.010	0.164
2004/08	-0.061	-0.042	-0.045	-0.060	-0.054	-0.032	-0.001	0.022	-0.054	0.164
2004/09	0.034	0.043	0.047	0.055	0.053	0.058	-0.014	0.008	0.063	0.164
2004/10	-0.101	-0.074	-0.080	-0.073	-0.047	-0.052	-0.028	0.021	-0.061	0.186
2004/11	0.071	0.060	0.055	0.053	0.032	0.010	0.031	-0.029	0.016	0.186
2004/12	-0.091	-0.089	-0.086	-0.081	-0.076	-0.066	-0.014	0.010	-0.076	0.186
2005/01	-0.059	-0.091	-0.072	-0.074	-0.077	-0.018	-0.018	0.021	-0.029	0.186
2005/02	0.114	0.113	0.101	0.112	0.114	0.085	0.006	-0.020	0.103	0.186
2005/03	-0.136	-0.142	-0.142	-0.126	-0.105	-0.067	-0.041	0.027	-0.070	0.186
2005/04	-0.111	-0.092	-0.121	-0.062	-0.021	0.015	-0.085	0.034	-0.022	0.186
2005/05	-0.028	-0.023	-0.020	-0.038	-0.055	-0.081	0.034	-0.017	-0.083	0.186
2005/06	-0.007	0.006	-0.014	0.004	-0.003	0.034	-0.017	0.011	0.026	0.186
2005/07	-0.092	-0.081	-0.091	-0.060	-0.051	0.024	-0.059	0.042	0.001	0.186
2005/08	0.194	0.180	0.200	0.152	0.117	0.043	0.087	-0.051	0.075	0.186
2005/09	0.042	0.030	0.015	0.025	0.032	-0.015	0.015	-0.033	0.014	0.186
2005/10	-0.062	-0.057	-0.080	-0.058	-0.056	-0.054	-0.010	-0.007	-0.090	0.186
2005/11	0.023	0.030	0.029	0.007	-0.005	-0.006	0.029	-0.003	0.012	0.186
2005/12	-0.005	0.009	0.008	0.041	0.048	0.061	-0.046	0.016	0.035	0.186
2006/01	0.063	0.079	0.112	0.108	0.138	0.119	-0.037	0.030	0.203	0.186
2006/02	0.036	0.023	0.018	0.017	0.022	0.045	-0.003	0.005	0.020	0.186
2006/03	-0.003	-0.006	-0.016	0.020	0.041	0.043	-0.043	0.005	0.023	0.186

2006/04	0.023	0.079	0.040	0.116	0.146	0.178	-0.099	0.040	0.089	0.186
2006/05	0.304	0.291	0.263	0.241	0.231	0.227	0.053	-0.028	0.164	0.186
2006/06	0.079	0.070	0.042	0.091	0.065	0.046	-0.004	-0.041	0.013	0.186
2006/07	-0.002	-0.009	-0.013	-0.030	-0.051	-0.071	0.043	-0.026	-0.033	0.186
2006/08	0.023	0.037	0.013	0.041	0.035	0.039	-0.014	-0.006	0.025	0.208
2006/09	0.104	0.067	0.066	0.045	0.036	0.052	0.035	-0.015	0.106	0.208
2006/10	-0.006	-0.006	0.003	-0.004	0.005	0.039	-0.016	0.026	0.023	0.208
2006/11	0.001	0.015	0.014	0.029	0.070	0.172	-0.080	0.078	0.116	0.208
2006/12	0.034	0.035	0.030	0.057	0.071	0.170	-0.066	0.054	0.155	0.208
2007/01	0.269	0.236	0.221	0.261	0.267	0.186	0.004	-0.062	0.152	0.208
2007/02	0.234	0.194	0.177	0.202	0.171	0.080	0.051	-0.090	0.091	0.208
2007/03	0.234	0.195	0.134	0.172	0.159	0.103	0.043	-0.084	0.073	0.230
2007/04	0.324	0.310	0.314	0.362	0.357	0.298	-0.023	-0.037	0.254	0.230
2007/05	0.139	0.069	0.065	0.084	0.106	0.149	-0.022	-0.004	0.156	0.252
2007/06	-0.186	-0.232	-0.233	-0.147	-0.110	0.002	-0.132	0.051	-0.073	0.252
2007/07	0.255	0.266	0.286	0.227	0.198	0.186	0.065	-0.005	0.217	0.273
2007/08	0.116	0.114	0.093	0.108	0.126	0.169	-0.027	0.019	0.064	0.295
2007/09	0.040	0.034	0.073	0.045	0.056	0.044	0.001	0.016	0.085	0.317
2007/10	-0.120	-0.117	-0.094	-0.113	-0.100	0.024	-0.047	0.081	0.028	0.317
2007/11	-0.046	-0.038	-0.051	-0.064	-0.102	-0.161	0.064	-0.051	-0.136	0.317
2007/12	0.211	0.204	0.164	0.202	0.207	0.143	0.009	-0.053	0.092	0.339
2008/01	-0.003	-0.007	-0.031	0.044	-0.036	0.032	-0.027	-0.020	-0.139	0.339
2008/02	0.107	0.097	0.076	0.030	0.056	0.010	0.062	-0.025	0.016	0.339
2008/03	-0.179	-0.189	-0.199	-0.166	-0.182	-0.207	-0.004	-0.030	-0.176	0.339
2008/04	-0.083	-0.095	-0.059	0.114	0.017	0.056	-0.142	-0.017	0.034	0.339
2008/05	-0.010	-0.027	-0.055	-0.061	-0.076	-0.080	0.041	-0.032	-0.058	0.339
2008/06	-0.251	-0.269	-0.251	-0.185	-0.230	-0.229	-0.042	-0.022	-0.168	0.339
2008/07	0.112	0.116	0.103	0.004	0.045	0.027	0.085	0.007	0.007	0.339
2008/08	-0.243	-0.216	-0.214	-0.171	-0.172	-0.154	-0.059	0.022	-0.195	0.339
2008/09	-0.112	-0.087	-0.097	-0.101	-0.060	-0.035	-0.034	0.040	-0.109	0.339
2008/10	-0.241	-0.247	-0.262	-0.274	-0.271	-0.267	0.021	-0.007	-0.283	0.295
2008/11	0.216	0.209	0.209	0.130	0.142	0.126	0.079	-0.005	0.148	0.208
2008/12	0.096	0.082	0.063	0.066	0.012	-0.029	0.064	-0.064	0.028	0.186
2009/01	0.155	0.151	0.153	0.148	0.178	0.117	0.005	-0.016	0.096	0.186
2009/02	0.109	0.069	0.071	0.097	0.061	0.051	0.013	-0.042	0.063	0.186
2009/03	0.255	0.219	0.210	0.207	0.215	0.162	0.034	-0.045	0.181	0.186
2009/04	0.078	0.076	0.063	0.069	0.054	0.050	0.015	-0.017	0.054	0.186
2009/05	0.109	0.070	0.076	0.069	0.068	0.046	0.024	-0.028	0.088	0.186
2009/06	0.098	0.050	0.056	0.151	0.134	0.129	-0.070	-0.032	0.127	0.186
2009/07	0.125	0.137	0.142	0.142	0.171	0.216	-0.041	0.045	0.154	0.186
2009/08	-0.148	-0.146	-0.147	-0.190	-0.225	-0.230	0.068	-0.020	-0.176	0.186

2009/09	0.032	0.029	0.051	0.066	0.074	0.033	-0.021	-0.007	0.052	0.186
2009/10	0.126	0.126	0.113	0.113	0.106	0.073	0.024	-0.027	0.087	0.186
2009/11	0.151	0.165	0.168	0.099	0.090	0.087	0.069	0.002	0.141	0.186
2009/12	0.030	0.044	0.037	0.002	0.022	0.040	0.016	0.022	0.020	0.186

Appendix B

S/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.25128	-0.02062	0.003163	0.022036	0.100765

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02708	0.006989	-3.875	0.000177
rm-rf	0.865172	0.032593	26.545	< 2e-16
smb	0.463559	0.09729	4.765	5.52E-06
hml	-1.39736	0.118561	-11.786	< 2e-16

Residual standard error: 0.04344 on 116 degrees of freedom
Multiple R-squared: 0.89, Adjusted R-squared: 0.8871
F-statistic: 312.8 on 3 and 116 DF, p-value: < 2.2e-16

S/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.28766	-0.03092	0.01651	0.05855	0.18213

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.27994	0.01477	-18.956	< 2e-16
rm-rf	-0.34109	0.06886	-4.953	2.51E-06
smb	-0.6716	0.20556	-3.267	0.001429
hml	0.99886	0.2505	3.987	1.17E-04

Residual standard error: 0.09179 on 116 degrees of freedom

Multiple R-squared: 0.3641, Adjusted R-squared: 0.3476
F-statistic: 22.14 on 3 and 116 DF, p-value: 2.093e-11

S/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.2042	-0.01997	0.004563	0.019395	0.085875

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02422	0.006325	-3.83	0.000209
rm-rf	0.889169	0.029493	30.149	< 2e-16
smb	0.629957	0.088036	7.156	8.09E-11
hml	-0.58662	0.107284	-5.468	2.65E-07

Residual standard error: 0.03931 on 116 degrees of freedom
Multiple R-squared: 0.9061, Adjusted R-squared: 0.9037
F-statistic: 373.2 on 3 and 116 DF, p-value: < 2.2e-16

B/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.21734	-0.01933	0.004814	0.019295	0.104093

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02894	0.006538	-4.426	2.18E-05
rm-rf	0.86434	0.030488	28.35	< 2e-16
smb	-0.43828	0.091007	-4.816	4.47E-06
hml	-1.56464	0.110904	-14.108	< 2e-16

Residual standard error: 0.04064 on 116 degrees of freedom
Multiple R-squared: 0.8869, Adjusted R-squared: 0.884
F-statistic: 303.4 on 3 and 116 DF, p-value: < 2.2e-16

B/M

Residuals:					

	Min	1Q	Median	3Q	Max
	-0.2869	-0.02514	0.005461	0.024443	0.085758

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02862	0.007906	-3.62	0.000438
rm-rf	0.871064	0.036868	23.627	<2e-16
smb	-0.39534	0.11005	-3.592	0.000482
hml	-1.08045	0.134111	-8.056	7.79E-13

Residual standard error: 0.04914 on 116 degrees of freedom
Multiple R-squared: 0.8339, Adjusted R-squared: 0.8296
F-statistic: 194.2 on 3 and 116 DF, p-value: < 2.2e-16

B/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.26441	-0.02151	0.005133	0.023436	0.112486

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.0318	0.007302	-4.355	2.89E-05
rm-rf	0.840343	0.03405	24.679	<2e-16
smb	-0.60468	0.10164	-5.949	2.92E-08
hml	-0.37538	0.123863	-3.031	3.01E-03

Residual standard error: 0.04539 on 116 degrees of freedom
Multiple R-squared: 0.8407, Adjusted R-squared: 0.8365
F-statistic: 204 on 3 and 116 DF, p-value: < 2.2e-16

Appendix C1

S/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.23533	-0.01898	0.000679	0.024356	0.098111

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02389	0.008327	-2.869	0.00492
rm-rf	0.881855	0.033947	25.978	< 2e-16
smb	0.357424	0.106372	3.36	0.00106
hml	-1.56758	0.140705	-11.141	< 2e-16
wml2mth	0.014083	0.109109	0.129	0.89753

Residual standard error: 0.0428 on 113 degrees of freedom
Multiple R-squared: 0.8937, Adjusted R-squared: 0.89
F-statistic: 237.6 on 4 and 113 DF, p-value: < 2.2e-16

S/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.28526	-0.03329	0.01731	0.06362	0.1707

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.27226	0.01796	-15.156	< 2e-16
rm-rf	-0.33392	0.07324	-4.559	0.0000131
smb	-0.61159	0.22949	-2.665	0.008825
hml	1.11589	0.30356	3.676	0.000364
wml2mth	-0.25367	0.23539	-1.078	0.283485

Residual standard error: 0.09234 on 113 degrees of freedom
Multiple R-squared: 0.3694, Adjusted R-squared: 0.3471
F-statistic: 16.55 on 4 and 113 DF, p-value: 1.058e-10

S/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.19388	-0.02036	0.004579	0.018093	0.09167

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)

(Intercept)	-0.0198	0.00761	-2.602	0.0105
rm-rf	0.90537	0.03102	29.183	< 2e-16
smb	0.54804	0.09721	5.638	0.000000129
hml	-0.71729	0.12859	-5.578	0.000000168
wml2mth	-0.03762	0.09971	-0.377	0.7067

Residual standard error: 0.03911 on 113 degrees of freedom
Multiple R-squared: 0.9092, Adjusted R-squared: 0.906
F-statistic: 282.9 on 4 and 113 DF, p-value: < 2.2e-16

B/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.20768	-0.01829	0.003573	0.020066	0.103064

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02528	0.007888	-3.204	0.00176
rm-rf	0.878548	0.032159	27.319	< 2e-16
smb	-0.51317	0.100771	-5.092	0.00000143
hml	-1.68251	0.133297	-12.622	< 2e-16
wml2mth	-0.02593	0.103364	-0.251	0.80237

Residual standard error: 0.04055 on 113 degrees of freedom
Multiple R-squared: 0.8826, Adjusted R-squared: 0.8784
F-statistic: 212.4 on 4 and 113 DF, p-value: < 2.2e-16

B/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.26782	-0.02443	0.004315	0.027944	0.084008

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02549	0.00946	-2.694	0.00813
rm-rf	0.88879	0.03857	23.046	< 2e-16
smb	-0.51425	0.12085	-4.255	0.0000433
hml	-1.27907	0.15985	-8.002	1.19E-12

wml2mth	0.03147	0.12396	0.254	0.80006

Residual standard error: 0.04862 on 113 degrees of freedom
Multiple R-squared: 0.8372, Adjusted R-squared: 0.8314
F-statistic: 145.2 on 4 and 113 DF, p-value: < 2.2e-16

B/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.24913	-0.02061	0.003805	0.022201	0.109982

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02936	0.008726	-3.365	0.001046
rm-rf	0.85503	0.035575	24.035	< 2e-16
smb	-0.70379	0.111474	-6.313	5.53E-09
hml	-0.53281	0.147455	-3.613	0.000453
wml2mth	0.025769	0.114343	0.225	0.822103

Residual standard error: 0.04485 on 113 degrees of freedom
Multiple R-squared: 0.8465, Adjusted R-squared: 0.8411
F-statistic: 155.8 on 4 and 113 DF, p-value: < 2.2e-16

Appendix C2

S/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.22456	-0.01586	0.001763	0.022749	0.095721

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.01528	0.01192	-1.282	0.20261
rm-rf	0.88568	0.03358	26.375	< 2e-16
smb	0.33977	0.11567	2.937	0.00409
hml	-1.61947	0.15376	-10.532	< 2e-16
wml1yr	-0.36592	0.38703	-0.945	0.34666

Residual standard error: 0.04331 on 102 degrees of freedom
Multiple R-squared: 0.9, Adjusted R-squared: 0.896
F-statistic: 229.4 on 4 and 102 DF, p-value: < 2.2e-16

S/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.2756	-0.03526	0.02974	0.06238	0.16867

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.25762	0.0264	-9.758	2.8E-16
rm-rf	-0.35018	0.07441	-4.706	0.00000796
smb	-0.54169	0.25631	-2.113	0.037003
hml	1.22764	0.34071	3.603	0.000488
wml1yr	-1.04211	0.85759	-1.215	0.227108

Residual standard error: 0.09598 on 102 degrees of freedom
Multiple R-squared: 0.3779, Adjusted R-squared: 0.3535
F-statistic: 15.49 on 4 and 102 DF, p-value: 6.201e-10

S/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.17038	-0.02262	0.003609	0.017082	0.079446

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.0175	0.01053	-1.662	0.0995
rm-rf	0.90529	0.02968	30.503	< 2e-16
smb	0.4928	0.10223	4.82	0.00000501
hml	-0.85351	0.13589	-6.281	8.36E-09
wml1yr	-0.22043	0.34205	-0.644	0.5207

Residual standard error: 0.03828 on 102 degrees of freedom
Multiple R-squared: 0.9185, Adjusted R-squared: 0.9153
F-statistic: 287.4 on 4 and 102 DF, p-value: < 2.2e-16

B/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.18711	-0.01888	0.002603	0.018239	0.098701

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02126	0.01107	-1.92	0.0577
rm-rf	0.87922	0.03121	28.171	< 2e-16
smb	-0.55791	0.10751	-5.189	0.00000108
hml	-1.79865	0.14291	-12.586	< 2e-16
wml1yr	-0.26573	0.35972	-0.739	0.4618

Residual standard error: 0.04026 on 102 degrees of freedom
Multiple R-squared: 0.8946, Adjusted R-squared: 0.8904
F-statistic: 216.3 on 4 and 102 DF, p-value: < 2.2e-16

B/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.24986	-0.02192	0.002867	0.030379	0.081015

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.01983	0.01345	-1.474	0.144
rm-rf	0.89504	0.03791	23.609	< 2e-16
smb	-0.5636	0.13059	-4.316	0.0000369
hml	-1.40056	0.17359	-8.068	1.45E-12
wml1yr	-0.23141	0.43694	-0.53	0.598

Residual standard error: 0.0489 on 102 degrees of freedom
Multiple R-squared: 0.8496, Adjusted R-squared: 0.8437
F-statistic: 144 on 4 and 102 DF, p-value: < 2.2e-16

B/H

Residuals:					
	Min	1Q	Median	3Q	Max

	-0.24129	-0.02033	0.003662	0.024764	0.107187

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.01903	0.01254	-1.518	0.132178
rm-rf	0.85962	0.03535	24.32	< 2e-16
smb	-0.71094	0.12175	-5.839	6.28E-08
hml	-0.56461	0.16185	-3.489	0.000718
wml1yr	-0.41122	0.40738	-1.009	0.315162

Residual standard error: 0.04559 on 102 degrees of freedom
Multiple R-squared: 0.8544, Adjusted R-squared: 0.8487
F-statistic: 149.7 on 4 and 102 DF, p-value: < 2.2e-16

Appendix C3

S/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.40818	-0.06066	0.00196	0.07922	0.29021

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.20158	0.01447	-13.929	<2e-16
wml2mth	0.63157	0.3147	2.007	0.0471

Residual standard error: 0.1274 on 116 degrees of freedom
Multiple R-squared: 0.03356, Adjusted R-squared: 0.02522
F-statistic: 4.028 on 1 and 116 DF, p-value: 0.04709

S/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.33396	-0.06051	0.01029	0.08719	0.20977

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.20422	0.01289	-15.84	<2e-16
wml2mth	-0.4542	0.28038	-1.62	0.108

Residual standard error: 0.1135 on 116 degrees of freedom
Multiple R-squared: 0.02212,   Adjusted R-squared: 0.01369
F-statistic: 2.624 on 1 and 116 DF, p-value: 0.108

S/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.40719	-0.0482	0.00829	0.06289	0.30187

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.20342	0.01428	-14.242	<2e-16
wml2mth	0.6568	0.3106	2.115	0.0366

Residual standard error: 0.1257 on 116 degrees of freedom
Multiple R-squared: 0.03712,   Adjusted R-squared: 0.02882
F-statistic: 4.472 on 1 and 116 DF, p-value: 0.0366

B/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.38042	-0.04101	0.00758	0.05769	0.28533

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.20003	0.01304	-15.343	<2e-16
wml2mth	0.57796	0.28351	2.039	0.0438

Residual standard error: 0.1148 on 116 degrees of freedom
Multiple R-squared: 0.03459,   Adjusted R-squared: 0.02627
F-statistic: 4.156 on 1 and 116 DF, p-value: 0.04376

B/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.38717	-0.04555	0.01024	0.05849	0.2757

Coefficients:				

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.2026	0.0132	-15.347	<2e-16
wml2mth	0.6708	0.2871	2.336	0.0212

Residual standard error: 0.1162 on 116 degrees of freedom
Multiple R-squared: 0.04493, Adjusted R-squared: 0.0367
F-statistic: 5.458 on 1 and 116 DF, p-value: 0.0212

B/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.38995	-0.04451	0.01386	0.05634	0.21499

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.1998	0.0125	-15.99	<2e-16
wml2mth	0.6868	0.2718	2.527	0.0128

Residual standard error: 0.11 on 116 degrees of freedom
Multiple R-squared: 0.05218, Adjusted R-squared: 0.04401
F-statistic: 6.386 on 1 and 116 DF, p-value: 0.01285

Appendix C4

S/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.402	-0.06406	0.00296	0.0872	0.30879

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.19596	0.03102	-6.318	6.52E-09
wml1yr	0.34867	1.18201	0.295	0.769

Residual standard error: 0.1349 on 105 degrees of freedom
Multiple R-squared: 0.000828, Adjusted R-squared: -0.008688
F-statistic: 0.08701 on 1 and 105 DF, p-value: 0.7686

S/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.32979	-0.05928	0.01213	0.09597	0.20374

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.1799	0.0273	-6.592	1.79E-09
wml1yr	-1.5188	1.0403	-1.46	0.147

Residual standard error: 0.1187 on 105 degrees of freedom
Multiple R-squared: 0.0199, Adjusted R-squared: 0.01056
F-statistic: 2.132 on 1 and 105 DF, p-value: 0.1473

S/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.39848	-0.05149	0.00374	0.07052	0.29905

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.20725	0.03034	-6.832	5.65E-10
wml1yr	0.67283	1.15605	0.582	0.562

Residual standard error: 0.132 on 105 degrees of freedom
Multiple R-squared: 0.003216, Adjusted R-squared: -0.006277
F-statistic: 0.3387 on 1 and 105 DF, p-value: 0.5618

B/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.38378	-0.05606	0.01367	0.07128	0.31729

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.18275	0.02809	-6.506	2.69E-09
wml1yr	-0.12001	1.07043	-0.112	0.911

Residual standard error: 0.1222 on 105 degrees of freedom
Multiple R-squared: 0.0001197, Adjusted R-squared: -0.009403
F-statistic: 0.01257 on 1 and 105 DF, p-value: 0.9109

B/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.38198	-0.05235	0.01599	0.06786	0.3138

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.18551	0.02857	-6.493	2.85E-09
wml1yr	-0.04065	1.08878	-0.037	0.97

Residual standard error: 0.1243 on 105 degrees of freedom
Multiple R-squared: 1.327e-05, Adjusted R-squared: -0.00951
F-statistic: 0.001394 on 1 and 105 DF, p-value: 0.9703

B/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.38469	-0.0466	0.02236	0.06238	0.25009

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.17707	0.02707	-6.541	2.27E-09
wml1yr	-	1.03158	-0.251	0.802

	0.25933			

Residual standard error: 0.1177 on 105 degrees of freedom
Multiple R-squared: 0.0006015, Adjusted R-squared: -0.008917
F-statistic: 0.0632 on 1 and 105 DF, p-value: 0.802

Appendix D1

S/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.24071	-0.0191	0.001698	0.024002	0.099869

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02633	0.007867	-3.346	0.00111
rm-rf	0.870052	0.036034	24.146	< 2e-16
smb	0.341795	0.107415	3.182	0.00189
hml	-1.49973	0.16002	-9.372	8.66E-16
ptopmu	0.083805	0.095863	0.874	0.38385

Residual standard error: 0.04266 on 113 degrees of freedom
Multiple R-squared: 0.8944, Adjusted R-squared: 0.8907
F-statistic: 239.3 on 4 and 113 DF, p-value: < 2.2e-16

S/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.27186	-0.03946	0.02152	0.06138	0.17113

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.26114	0.01649	-15.834	< 2e-16
rm-rf	-0.2615	0.07554	-3.462	0.000759
smb	-0.4971	0.22518	-2.208	0.029299
hml	0.6311	0.33546	1.881	0.062509

ptopmu	-0.59291	0.20097	-2.95	0.00386

Residual standard error: 0.08943 on 113 degrees of freedom
Multiple R-squared: 0.4085, Adjusted R-squared: 0.3876
F-statistic: 19.51 on 4 and 113 DF, p-value: 3.136e-12

S/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.20403	-0.01803	0.005052	0.020472	0.093265

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02861	0.007043	-4.062	0.00009
rm-rf	0.8714	0.032261	27.011	< 2e-16
smb	0.511754	0.096168	5.321	0.000000528
hml	-0.55397	0.143265	-3.867	0.000185
ptopmu	0.2044	0.085825	2.382	0.018909

Residual standard error: 0.03819 on 113 degrees of freedom	
Multiple R-squared: 0.9134, Adjusted R-squared: 0.9104	
F-statistic: 298.1 on 4 and 113 DF, p-value: < 2.2e-16	

B/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.21755	-0.01975	0.004076	0.017907	0.084448

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.03315	0.007332	-4.521	0.0000152
rm-rf	0.847436	0.033585	25.233	< 2e-16
smb	-0.54735	0.100115	-5.467	0.000000277
hml	-1.52946	0.149145	-10.255	< 2e-16
ptopmu	0.191197	0.089348	2.14	0.0345

Residual standard error: 0.03976 on 113 degrees of freedom
Multiple R-squared: 0.8871, Adjusted R-squared: 0.8831

F-statistic: 222 on 4 and 113 DF, p-value: < 2.2e-16

B/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.28212	-0.02371	0.005848	0.026346	0.086831

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.03235	0.008797	-3.678	0.000362
rm-rf	0.856356	0.040293	21.253	< 2e-16
smb	-0.5564	0.120112	-4.632	0.00000974
hml	-1.09555	0.178935	-6.123	1.37E-08
ptopmu	0.2269	0.107195	2.117	0.036479

Residual standard error: 0.0477 on 113 degrees of freedom
Multiple R-squared: 0.8433, Adjusted R-squared: 0.8377
F-statistic: 152 on 4 and 113 DF, p-value: < 2.2e-16

B/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.25424	-0.01893	0.00399	0.02243	0.11162

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.03086	0.008255	-3.739	0.000292
rm-rf	0.846088	0.037813	22.376	< 2e-16
smb	-0.71731	0.112719	-6.364	4.35E-09
hml	-0.47522	0.167921	-2.83	0.005511
ptopmu	0.070601	0.100596	0.702	0.48423

Residual standard error: 0.04477 on 113 degrees of freedom
Multiple R-squared: 0.8471, Adjusted R-squared: 0.8417
F-statistic: 156.5 on 4 and 113 DF, p-value: < 2.2e-16

Appendix D2

S/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.23919	-0.01827	0.001945	0.021704	0.110979

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02866	0.007346	-3.902	0.000163
rm-rf	0.860703	0.033791	25.472	< 2e-16
smb	0.304878	0.106618	2.86	0.005054
hml	-1.47375	0.1438	-10.249	< 2e-16
pmedmu	0.279242	0.124444	2.244	0.026787

Residual standard error: 0.04188 on 113 degrees of freedom
Multiple R-squared: 0.8982, Adjusted R-squared: 0.8946
F-statistic: 249.4 on 4 and 113 DF, p-value: < 2.2e-16

S/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.2662	-0.03774	0.0137	0.06559	0.19083

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.26869	0.01579	-17.021	< 2e-16
rm-rf	-0.29536	0.07262	-4.067	0.0000883
smb	-0.47133	0.22912	-2.057	0.04198
hml	0.8687	0.30903	2.811	0.00582
pmedmu	-0.71592	0.26743	-2.677	0.00853

Residual standard error: 0.09 on 113 degrees of freedom
Multiple R-squared: 0.4009, Adjusted R-squared: 0.3797
F-statistic: 18.91 on 4 and 113 DF, p-value: 6.318e-12

S/H

Residuals:					

	Min	1Q	Median	3Q	Max
	-0.19721	-0.01749	0.00186	0.01976	0.09281

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02925	0.006464	-4.525	0.000015
rm-rf	0.869609	0.029734	29.246	< 2e-16
smb	0.471175	0.093817	5.022	0.00000192
hml	-0.57915	0.126535	-4.577	0.0000122
pmedmu	0.416411	0.109504	3.803	0.000233

Residual standard error: 0.03685 on 113 degrees of freedom
Multiple R-squared: 0.9194, Adjusted R-squared: 0.9166
F-statistic: 322.3 on 4 and 113 DF, p-value: < 2.2e-16

B/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.21132	-0.01834	0.001898	0.019346	0.099052

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.03397	0.006756	-5.028	0.00000188
rm-rf	0.844845	0.031079	27.184	< 2e-16
smb	-0.58746	0.098061	-5.991	2.54E-08
hml	-1.54916	0.132259	-11.713	< 2e-16
pmedmu	0.401051	0.114457	3.504	0.000658

Residual standard error: 0.03852 on 113 degrees of freedom
Multiple R-squared: 0.894, Adjusted R-squared: 0.8903
F-statistic: 238.4 on 4 and 113 DF, p-value: < 2.2e-16

B/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.27483	-0.021	0.002666	0.024944	0.102481

Coefficients:				

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.0335	0.008094	-4.139	0.0000675
rm-rf	0.852541	0.037235	22.897	< 2e-16
smb	-0.60574	0.117484	-5.156	0.00000109
hml	-1.11581	0.158455	-7.042	1.57E-10
pmedmu	0.485249	0.137127	3.539	0.000585

Residual standard error: 0.04615 on 113 degrees of freedom
Multiple R-squared: 0.8533, Adjusted R-squared: 0.8481
F-statistic: 164.3 on 4 and 113 DF, p-value: < 2.2e-16

B/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.2533	-0.01911	0.003833	0.022306	0.122282

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.03338	0.007731	-4.317	0.0000341
rm-rf	0.835939	0.035564	23.505	< 2e-16
smb	-0.75376	0.112214	-6.717	7.83E-10
hml	-0.44376	0.151347	-2.932	0.00408
pmedmu	0.263882	0.130976	2.015	0.04631

Residual standard error: 0.04408 on 113 degrees of freedom
Multiple R-squared: 0.8518, Adjusted R-squared: 0.8465
F-statistic: 162.3 on 4 and 113 DF, p-value: < 2.2e-16

Appendix D3

S/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.34089	-0.05737	0.01646	0.07768	0.25375

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)

(Intercept)	-0.19362	0.01015	-19.078	< 2e-16
PtopMU	1.28716	0.18771	6.857	3.62E-10

Residual standard error: 0.1093 on 116 degrees of freedom
Multiple R-squared: 0.2884, Adjusted R-squared: 0.2823
F-statistic: 47.02 on 1 and 116 DF, p-value: 3.62e-10

S/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.27393	-0.05343	0.005399	0.074981	0.164914

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.20841	0.008975	-23.221	< 2e-16
PtopMU	-1.14442	0.166001	-6.894	3.01E-10

Residual standard error: 0.09666 on 116 degrees of freedom
Multiple R-squared: 0.2906, Adjusted R-squared: 0.2845
F-statistic: 47.53 on 1 and 116 DF, p-value: 3.012e-10

S/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.3519	-0.04985	0.01329	0.06974	0.21756

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.19405	0.01031	-18.827	< 2e-16
PtopMU	1.18326	0.19064	6.207	8.65E-09

Residual standard error: 0.111 on 116 degrees of freedom
Multiple R-squared: 0.2493, Adjusted R-squared: 0.2428
F-statistic: 38.52 on 1 and 116 DF, p-value: 8.651e-09

B/L

Residuals:					

	Min	1Q	Median	3Q	Max
	-0.36684	-0.04194	0.0065	0.06329	0.19873

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.19207	0.009389	-20.457	< 2e-16
PtopMU	1.081054	0.173654	6.225	7.91E-09

Residual standard error: 0.1011 on 116 degrees of freedom
Multiple R-squared: 0.2504, Adjusted R-squared: 0.244
F-statistic: 38.75 on 1 and 116 DF, p-value: 7.912e-09

B/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.36558	-0.04215	0.01198	0.05995	0.19232

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.19154	0.009861	-19.424	< 2e-16
PtopMU	0.98988	0.18239	5.427	0.000000318

Residual standard error: 0.1062 on 116 degrees of freedom
Multiple R-squared: 0.2025, Adjusted R-squared: 0.1956
F-statistic: 29.46 on 1 and 116 DF, p-value: 3.179e-07

B/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.37158	-0.04116	0.01449	0.05828	0.21742

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.18545	0.01007	-18.411	< 2e-16
PtopMU	0.58448	0.18631	3.137	0.00216

Residual standard error: 0.1085 on 116 degrees of freedom

Multiple R-squared: 0.0782, Adjusted R-squared: 0.07026
F-statistic: 9.841 on 1 and 116 DF, p-value: 0.002163

Appendix D4

S/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.3797	-0.05676	0.01133	0.07193	0.32524

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.19142	0.01053	-18.181	< 2e-16
PmedMU	1.70024	0.2885	5.893	3.79E-08

Residual standard error: 0.1137 on 116 degrees of freedom
Multiple R-squared: 0.2304, Adjusted R-squared: 0.2238
F-statistic: 34.73 on 1 and 116 DF, p-value: 3.788e-08

S/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.27916	-0.06228	0.00158	0.0805	0.21142

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.21042	0.009346	-22.516	< 2e-16
PmedMU	-1.49522	0.256067	-5.839	4.88E-08

Residual standard error: 0.1009 on 116 degrees of freedom
Multiple R-squared: 0.2272, Adjusted R-squared: 0.2205
F-statistic: 34.1 on 1 and 116 DF, p-value: 4.876e-08

S/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.36654	-0.05728	0.01189	0.08011	0.2843

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.19235	0.01048	-18.349	< 2e-16
PmedMU	1.64182	0.28724	5.716	8.61E-08

Residual standard error: 0.1132 on 116 degrees of freedom
Multiple R-squared: 0.2198, Adjusted R-squared: 0.213
F-statistic: 32.67 on 1 and 116 DF, p-value: 8.607e-08

B/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.3805	-0.03367	0.0069	0.06214	0.25843

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.19012	0.00972	-19.56	< 2e-16
PmedMU	1.40173	0.26632	5.263	0.000000657

Residual standard error: 0.1049 on 116 degrees of freedom
Multiple R-squared: 0.1928, Adjusted R-squared: 0.1858
F-statistic: 27.7 on 1 and 116 DF, p-value: 6.572e-07

B/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.37791	-0.04755	0.01393	0.05678	0.24781

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.19001	0.01003	-18.951	< 2e-16
PmedMU	1.3468	0.27471	4.903	0.0000031

Residual standard error: 0.1082 on 116 degrees of freedom
Multiple R-squared: 0.1716, Adjusted R-squared: 0.1645
F-statistic: 24.04 on 1 and 116 DF, p-value: 3.105e-06

B/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.37877	-0.04306	0.02055	0.05662	0.23361

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.18467	0.01009	-18.31	< 2e-16
PmedMU	0.82533	0.27636	2.986	0.00344

Residual standard error: 0.1089 on 116 degrees of freedom
Multiple R-squared: 0.0714, Adjusted R-squared: 0.06339
F-statistic: 8.919 on 1 and 116 DF, p-value: 0.003444

Appendix E1

S/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.17452	-0.01833	0.00273	0.02102	0.11804

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.01204	0.006925	-1.738	0.0849
rm-rf	0.946521	0.03309	28.604	< 2e-16
smb	0.285028	0.098438	2.896	0.00455
hml	-1.7654	0.135357	-13.043	< 2e-16
HGMLG	-0.67704	0.143869	-4.706	0.00000722

Residual standard error: 0.03914 on 113 degrees of freedom
Multiple R-squared: 0.9111, Adjusted R-squared: 0.908
F-statistic: 289.6 on 4 and 113 DF, p-value: < 2.2e-16

S/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.27687	-0.03292	0.0215	0.06086	0.17222

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)

(Intercept)	-0.28559	0.0164	-17.418	< 2e-16
rm-rf	-0.37043	0.07835	-4.728	0.0000066
smb	-0.58449	0.23309	-2.508	0.01358
hml	1.16497	0.32051	3.635	0.00042
HGMLG	0.19401	0.34067	0.57	0.57015

Residual standard error: 0.09268 on 113 degrees of freedom
Multiple R-squared: 0.3648, Adjusted R-squared: 0.3423
F-statistic: 16.22 on 4 and 113 DF, p-value: 1.584e-10

S/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.16131	-0.02079	0.003576	0.017508	0.106145

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.0156	0.006749	-2.311	0.0227
rm-rf	0.93482	0.032252	28.985	< 2e-16
smb	0.512605	0.095944	5.343	0.00000048
hml	-0.81859	0.131928	-6.205	9.27E-09
HGMLG	-0.34204	0.140224	-2.439	0.0163

Residual standard error: 0.03815 on 113 degrees of freedom
Multiple R-squared: 0.9136, Adjusted R-squared: 0.9106
F-statistic: 298.9 on 4 and 113 DF, p-value: < 2.2e-16

B/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.16909	-0.02148	0.004779	0.017317	0.107112

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.01941	0.006927	-2.802	0.00597
rm-rf	0.915579	0.0331	27.661	< 2e-16
smb	-0.55653	0.098468	-5.652	1.21E-07
hml	-1.80445	0.135398	-13.327	< 2e-16
HGMLG	-0.41375	0.143912	-2.875	0.00483

Residual standard error: 0.03915 on 113 degrees of freedom
Multiple R-squared: 0.8905, Adjusted R-squared: 0.8867
F-statistic: 229.8 on 4 and 113 DF, p-value: < 2.2e-16

B/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.21902	-0.02292	0.004899	0.023764	0.129609

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.01502	0.008233	-1.824	0.07076
rm-rf	0.943016	0.039344	23.968	< 2e-16
smb	-0.57386	0.117043	-4.903	0.00000319
hml	-1.43993	0.160939	-8.947	8.3E-15
HGMLG	-0.55264	0.17106	-3.231	0.00162

Residual standard error: 0.04654 on 113 degrees of freedom
Multiple R-squared: 0.8508, Adjusted R-squared: 0.8456
F-statistic: 161.1 on 4 and 113 DF, p-value: < 2.2e-16

B/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.18231	-0.0187	0.001618	0.021433	0.119008

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.01585	0.007177	-2.209	0.0292
rm-rf	0.92728	0.034296	27.038	< 2e-16
smb	-0.78411	0.102023	-7.686	6.05E-12
hml	-0.75126	0.140287	-5.355	4.55E-07
HGMLG	-0.74875	0.149109	-5.022	0.00000193

Residual standard error: 0.04056 on 113 degrees of freedom
Multiple R-squared: 0.8745, Adjusted R-squared: 0.87
F-statistic: 196.8 on 4 and 113 DF, p-value: < 2.2e-16

Appendix E2

S/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.22229	-0.01768	0.001517	0.02189	0.091072

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.01834	0.007409	-2.475	0.0148
rm-rf	0.905712	0.03439	26.337	< 2e-16
smb	0.297885	0.108574	2.744	0.00707
hml	-1.70135	0.153545	-11.08	< 2e-16
MGMLG	-0.43752	0.217931	-2.008	0.04707

Residual standard error: 0.04206 on 113 degrees of freedom
Multiple R-squared: 0.8974, Adjusted R-squared: 0.8937
F-statistic: 247 on 4 and 113 DF, p-value: < 2.2e-16

S/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.2833	-0.03134	0.01877	0.06007	0.17751

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.28263	0.01635	-17.287	< 2e-16
rm-rf	-0.35344	0.07589	-4.658	0.00000879
smb	-0.60189	0.23958	-2.512	0.01341
hml	1.11551	0.33882	3.292	0.00133
MGMLG	0.02396	0.48089	0.05	0.96035

Residual standard error: 0.09281 on 113 degrees of freedom
Multiple R-squared: 0.363, Adjusted R-squared: 0.3404
F-statistic: 16.1 on 4 and 113 DF, p-value: 1.852e-10

S/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.18969	-0.02046	0.004921	0.020277	0.091448

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02034	0.00689	-2.952	0.00384
rm-rf	0.90707	0.03198	28.366	< 2e-16
smb	0.53757	0.10096	5.325	0.00000052
hml	-0.74435	0.14277	-5.214	0.000000846
MGMLG	-0.0845	0.20264	-0.417	0.67749

Residual standard error: 0.03911 on 113 degrees of freedom
Multiple R-squared: 0.9092, Adjusted R-squared: 0.906
F-statistic: 283 on 4 and 113 DF, p-value: < 2.2e-16

B/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.20079	-0.0188	0.004178	0.021205	0.096618

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02418	0.00712	-3.396	0.000944
rm-rf	0.88643	0.03305	26.825	< 2e-16
smb	-0.53778	0.10433	-5.155	0.00000109
hml	-1.74059	0.14754	-11.797	< 2e-16
MGMLG	-0.18679	0.20941	-0.892	0.374313

Residual standard error: 0.04042 on 113 degrees of freedom
Multiple R-squared: 0.8834, Adjusted R-squared: 0.8792
F-statistic: 213.9 on 4 and 113 DF, p-value: < 2.2e-16

B/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.26521	-0.02507	0.003902	0.026379	0.084935

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.0228	0.008559	-2.664	0.00885
rm-rf	0.897632	0.039725	22.596	< 2e-16
smb	-0.53208	0.125418	-4.242	0.0000455
hml	-1.31672	0.177366	-7.424	2.3E-11
MGMLG	-0.12588	0.25174	-0.5	0.61803

Residual standard error: 0.04858 on 113 degrees of freedom
Multiple R-squared: 0.8374, Adjusted R-squared: 0.8317
F-statistic: 145.5 on 4 and 113 DF, p-value: < 2.2e-16

B/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.23339	-0.02004	-0.00058	0.024017	0.101392

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.02218	0.007712	-2.876	0.00481
rm-rf	0.885068	0.035796	24.725	< 2e-16
smb	-0.77746	0.113014	-6.879	3.53E-10
hml	-0.69759	0.159824	-4.365	0.0000283
MGMLG	-0.53981	0.226843	-2.38	0.019

Residual standard error: 0.04378 on 113 degrees of freedom
Multiple R-squared: 0.8538, Adjusted R-squared: 0.8486
F-statistic: 164.9 on 4 and 113 DF, p-value: < 2.2e-16

Appendix E3

S/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.47505	-0.05752	0.00965	0.08088	0.29016

Coefficients:				

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.18423	0.01151	-16.01	< 2e-16
HGMLG	1.20874	0.41057	2.944	0.00391

Residual standard error: 0.125 on 116 degrees of freedom
Multiple R-squared: 0.06953, Adjusted R-squared: 0.0615
F-statistic: 8.668 on 1 and 116 DF, p-value: 0.003914

S/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.34171	-0.04714	0.00876	0.09217	0.1851

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.21665	0.01041	-20.817	<2e-16
HGMLG	-0.7006	0.37133	-1.887	0.0617

Residual standard error: 0.113 on 116 degrees of freedom
Multiple R-squared: 0.02977, Adjusted R-squared: 0.02141
F-statistic: 3.56 on 1 and 116 DF, p-value: 0.0617

S/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.45335	-0.04959	0.01825	0.07269	0.26397

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.18536	0.01128	-16.44	< 2e-16
HGMLG	1.32776	0.4024	3.3	0.00129

Residual standard error: 0.1225 on 116 degrees of freedom
Multiple R-squared: 0.0858, Adjusted R-squared: 0.07792
F-statistic: 10.89 on 1 and 116 DF, p-value: 0.001286

B/L

Residuals:					
	Min	1Q	Median	3Q	Max

	-0.41239	-0.04499	0.00835	0.0659	0.22571

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.18409	0.01016	-18.118	<2e-16
HGMLG	1.35149	0.36254	3.728	0.0003

Residual standard error: 0.1104 on 116 degrees of freedom
Multiple R-squared: 0.107, Adjusted R-squared: 0.09928
F-statistic: 13.9 on 1 and 116 DF, p-value: 0.0003002

B/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.42459	-0.04545	0.01904	0.0697	0.22694

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.18425	0.01052	-17.517	< 2e-16
HGMLG	1.16801	0.37529	3.112	0.00234

Residual standard error: 0.1143 on 116 degrees of freedom
Multiple R-squared: 0.07707, Adjusted R-squared: 0.06911
F-statistic: 9.686 on 1 and 116 DF, p-value: 0.002338

B/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.41332	-0.0418	0.0204	0.05838	0.22474

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.18113	0.01021	-17.741	<2e-16
HGMLG	0.76699	0.36427	2.106	0.0374

Residual standard error: 0.1109 on 116 degrees of freedom
Multiple R-squared: 0.03681, Adjusted R-squared: 0.02851
F-statistic: 4.433 on 1 and 116 DF, p-value: 0.0374

Appendix E4

S/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.45521	-0.06224	0.00936	0.07992	0.3135

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.18768	0.01164	-16.128	< 2e-16
MGMLG	1.53422	0.57445	2.671	0.00866

Residual standard error: 0.1258 on 116 degrees of freedom
Multiple R-squared: 0.05793, Adjusted R-squared: 0.04981
F-statistic: 7.133 on 1 and 116 DF, p-value: 0.008656

S/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.33748	-0.05089	0.00802	0.09047	0.19877

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.2145	0.01046	-20.501	<2e-16
MGMLG	-0.96286	0.51653	-1.864	0.0648

Residual standard error: 0.1131 on 116 degrees of freedom
Multiple R-squared: 0.02908, Adjusted R-squared: 0.02071
F-statistic: 3.475 on 1 and 116 DF, p-value: 0.06484

S/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.42063	-0.05183	0.01614	0.07521	0.27661

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.18856	0.01156	-16.313	<2e-16
MGMLG	1.39845	0.57064	2.451	0.0158

Residual standard error: 0.1249 on 116 degrees of freedom
Multiple R-squared: 0.04923, Adjusted R-squared: 0.04103
F-statistic: 6.006 on 1 and 116 DF, p-value: 0.01575

B/L

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.39346	-0.04344	0.01189	0.06388	0.25239

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.18812	0.01026	-18.331	< 2e-16
MGMLG	1.80068	0.50659	3.554	0.000549

Residual standard error: 0.1109 on 116 degrees of freedom
Multiple R-squared: 0.09822, Adjusted R-squared: 0.09045
F-statistic: 12.63 on 1 and 116 DF, p-value: 0.000549

B/M

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.38915	-0.04136	0.01579	0.06206	0.24153

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.18794	0.01055	-17.812	< 2e-16
MGMLG	1.66052	0.52087	3.188	0.00184

Residual standard error: 0.114 on 116 degrees of freedom
Multiple R-squared: 0.08056, Adjusted R-squared: 0.07263
F-statistic: 10.16 on 1 and 116 DF, p-value: 0.001842

B/H

Residuals:					
	Min	1Q	Median	3Q	Max
	-0.37907	-0.04058	0.01738	0.06015	0.23181

Coefficients:				

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.18321	0.01031	-17.771	<2e-16
MGMLG	0.92319	0.50896	1.814	0.0723

Residual standard error: 0.1114 on 116 degrees of freedom
Multiple R-squared: 0.02758,   Adjusted R-squared: 0.0192
F-statistic: 3.29 on 1 and 116 DF, p-value: 0.07228

Appendix F1

Regressions	**R-squared for 6 Fama-French portfolios**						
	S/L	**S/M**	**S/H**	**B/L**	**B/M**	**B/H**	**Average**
FM + WML1yr	0.900	0.378	0.919	0.895	0.850	0.854	**0.799**
FM + WML2mth	0.894	0.369	0.909	0.883	0.837	0.847	**0.790**
FM + PtopMU	0.891	0.409	0.913	0.887	0.843	0.847	**0.798**
FM + PmedMU	0.898	0.401	0.919	0.894	0.853	0.852	**0.803**
FM + HGMLG	0.911	0.365	0.914	0.891	0.851	0.875	**0.801**
FM + MGMLG	0.897	0.363	0.909	0.883	0.837	0.854	**0.791**
FM + WML1yr + PtopMU	0.901	0.426	0.924	0.900	0.856	0.855	**0.810**
FM + WML1yr + PmedMU	0.905	0.417	0.930	0.907	0.867	0.861	**0.815**
FM + WML1yr + HGMLG	0.916	0.380	0.923	0.902	0.863	0.881	**0.811**
FM + WML1yr + MGMLG	0.904	0.378	0.919	0.895	0.850	0.862	**0.801**
FM + WML2mth + PtopMU	0.894	0.415	0.914	0.887	0.843	0.847	**0.800**
FM + WML2mth + PmedMU	0.898	0.410	0.919	0.894	0.854	0.852	**0.805**
FM + WML2mth + HGMLG	0.911	0.371	0.914	0.891	0.851	0.875	**0.802**
FM + WML2mth + MGMLG	0.897	0.370	0.909	0.883	0.838	0.854	**0.792**
FM + PtopMU + HGMLG	0.913	0.414	0.919	0.897	0.860	0.877	**0.813**
FM + PtopMU + MGMLG	0.899	0.411	0.914	0.889	0.845	0.856	**0.802**
FM + PmedMU + HGMLG	0.919	0.406	0.926	0.905	0.872	0.884	**0.819**
FM + PmedMU + MGMLG	0.904	0.403	0.921	0.897	0.855	0.862	**0.807**
FM + WML1yr + PtopMU + HGMLG	0.918	0.430	0.929	0.909	0.872	0.883	**0.824**
FM + WML1yr + PtopMU + MGLMG	0.906	0.429	0.924	0.902	0.858	0.864	**0.814**

FM + WML1yr + PmedMU + HGMLG	0.924	0.422	0.936	0.917	0.885	0.890	**0.829**
FM + WML1yr + PmedMU + MGLMG	0.911	0.420	0.931	0.910	0.869	0.871	**0.819**
FM + WML2mth + PtopMU + HGMLG	0.913	0.420	0.920	0.897	0.860	0.877	**0.815**
FM + WML2mth + PtopMU + MGLMG	0.899	0.417	0.914	0.889	0.845	0.856	**0.803**
FM + WML2mth + PmedMU + HGMLG	0.919	0.415	0.926	0.905	0.872	0.884	**0.820**
FM + WML2mth + PmedMU + MGLMG	0.904	0.412	0.921	0.897	0.856	0.863	**0.809**

Appendix F2

Regressions	**Number of Fama-French portfolios at which a pricing variable is significant at the 5% level of significance**									
	beta	**SMB**	**HML**	**WML1yr**	**WML2mth**	**PtopMU**	**PmedMU**	**HGMLG**	**MGMLG**	**Average**
FM + WML1yr	6	6	6	0	N/A	N/A	N/A	N/A	N/A	**4.50**
FM + WML2mth	6	6	6	N/A	0	N/A	N/A	N/A	N/A	**4.50**
FM + PtopMU	6	6	5	N/A	N/A	4	N/A	N/A	N/A	**5.25**
FM + PmedMU	6	6	6	N/A	N/A	N/A	6	N/A	N/A	**6.00**
FM + HGMLG	6	6	6	N/A	N/A	N/A	N/A	5	N/A	**5.75**
FM + MGMLG	6	6	6	N/A	N/A	N/A	N/A	N/A	2	**5.00**
FM + WML1yr + PtopMU	6	6	6	0	N/A	4	N/A	N/A	N/A	**4.40**
FM + WML1yr + PmedMU	6	5	6	0	N/A	N/A	6	N/A	N/A	**4.60**
FM + WML1yr +	6	6	6	0	N/A	N/A	N/A	5	N/A	**4.60**

HGMLG										
FM + WML1yr + MGMLG	6	6	6	0	N/A	N/A	N/A	N/A	1	**3.80**
FM + WML2mth + PtopMU	6	6	5	N/A	0	4	N/A	N/A	N/A	**4.20**
FM + WML2mth + PmedMU	6	6	6	N/A	0	N/A	6	N/A	N/A	**4.80**
FM + WML2mth + HGMLG	6	6	6	N/A	0	N/A	N/A	5	N/A	**4.60**
FM + WML2mth + MGMLG	6	6	6	N/A	0	N/A	N/A	N/A	2	**4.00**
FM + PtopMU + HGMLG	6	6	6	N/A	N/A	4	N/A	5	N/A	**5.40**
FM + PtopMU + MGMLG	6	5	5	N/A	N/A	4	N/A	N/A	2	**4.40**
FM + PmedMU + HGMLG	6	5	6	N/A	N/A	N/A	6	5	N/A	**5.60**
FM + PmedMU + MGMLG	6	5	6	N/A	N/A	N/A	6	N/A	2	**5.00**
FM + WML1yr + PtopMU + HGMLG	6	5	6	0	N/A	4	N/A	5	N/A	**4.33**
FM + WML1yr + PtopMU + MGLMG	6	4	6	0	N/A	4	N/A	N/A	2	**3.67**
FM + WML1yr + PmedMU + HGMLG	6	4	6	0	N/A	N/A	6	5	N/A	**4.50**
FM + WML1yr + PmedMU + MGLMG	6	4	6	0	N/A	N/A	6	N/A	2	**4.00**
FM + WML2mth	6	6	6	N/A	0	4	N/A	5	N/A	**4.50**

+ PtopMU + HGMLG										
FM + WML2mth + PtopMU + MGLMG	6	6	6	N/A	0	4	N/A	N/A	2	**4.00**
FM + WML2mth + PmedMU + HGMLG	6	5	6	N/A	0	N/A	6	5	N/A	**4.67**
FM + WML2mth + PmedMU + MGLMG	6	4	6	N/A	0	N/A	6	N/A	2	**4.00**

Appendix G1

Dates	**FM + WML1yr + PmedMU + HGMLG**	**FM + WML1yr + PtopMU + HGMLG**	**FM + WML2mth + PmedMU + HGMLG**	**FM + WML1yr + PmedMU + MGLMG**	**FM + PmedMU + HGMLG**	**FM + WML1yr + PmedMU**
2010/01	0.0081	0.0067	0.0097	0.0110	0.0037	0.0109
2010/02	0.0175	0.0191	0.0202	0.0207	0.0144	0.0237
2010/03	0.0150	0.0191	0.0204	0.0168	0.0113	0.0196
2010/04	-0.0056	-0.0081	-0.0037	-0.0047	-0.0126	-0.0064
2010/05	-0.0137	-0.0119	-0.0142	-0.0168	-0.0221	-0.0196
2010/06	-0.0040	-0.0010	-0.0069	-0.0041	-0.0090	-0.0024
2010/07	0.0300	0.0307	0.0289	0.0352	0.0304	0.0375
2010/08	0.0179	0.0190	0.0137	0.0259	0.0154	0.0306
2010/09	0.0091	0.0061	0.0159	0.0080	0.0033	0.0127
2010/10	0.0161	0.0132	0.0225	0.0208	0.0113	0.0227
2010/11	0.0139	0.0155	0.0149	0.0117	0.0099	0.0144
2010/12	0.0052	0.0055	0.0029	0.0062	-0.0009	0.0095

Appendix G2

Dates	FM + WML2mth + PtopMU + HGMLG	FM + WML1yr + PtopMU + MGLMG	FM + PtopMU + HGMLG	FM + WML1yr + HGMLG	FM + WML1yr + PtopMU	FM + WML2mth + PmedMU + MGLMG
2010/01	0.0083	0.0096	0.0020	0.0005	0.0093	0.0126
2010/02	0.0218	0.0223	0.0164	0.0147	0.0257	0.0234
2010/03	0.0246	0.0209	0.0162	0.0175	0.0246	0.0222
2010/04	-0.0062	-0.0072	-0.0156	-0.0076	-0.0094	-0.0028
2010/05	-0.0124	-0.0150	-0.0199	-0.0133	-0.0173	-0.0173
2010/06	-0.0039	-0.0011	-0.0054	0.0015	0.0012	-0.0070
2010/07	0.0297	0.0359	0.0313	0.0298	0.0384	0.0341
2010/08	0.0148	0.0270	0.0167	0.0082	0.0319	0.0217
2010/09	0.0129	0.0050	-0.0003	0.0077	0.0091	0.0149
2010/10	0.0196	0.0179	0.0078	0.0186	0.0193	0.0272
2010/11	0.0165	0.0133	0.0118	0.0108	0.0163	0.0126
2010/12	0.0031	0.0065	-0.0006	0.0079	0.0098	0.0039

Appendix G3

Dates	FM + PmedMU + MGMLG	FM + WML2mth + PmedMU	FM + WML2mth + PtopMU + MGLMG	FM + PmedMU	FM + WML2mth + HGMLG	FM + PtopMU + MGMLG
2010/01	0.0071	0.0129	0.0112	0.0061	0.0024	0.0054
2010/02	0.0183	0.0270	0.0250	0.0215	0.0179	0.0203
2010/03	0.0134	0.0262	0.0264	0.0162	0.0241	0.0184
2010/04	-0.0115	-0.0041	-0.0054	-0.0154	-0.0054	-0.0146
2010/05	-0.0259	-0.0202	-0.0155	-0.0315	-0.0139	-0.0236
2010/06	-0.0091	-0.0059	-0.0039	-0.0083	-0.0020	-0.0055
2010/07	0.0366	0.0363	0.0348	0.0400	0.0285	0.0375
2010/08	0.0249	0.0255	0.0228	0.0305	0.0032	0.0263
2010/09	0.0020	0.0209	0.0119	0.0064	0.0159	-0.0016
2010/10	0.0169	0.0305	0.0243	0.0184	0.0263	0.0135
2010/11	0.0072	0.0155	0.0142	0.0095	0.0120	0.0091
2010/12	0.0003	0.0067	0.0041	0.0030	0.0051	0.0006

Appendix G4

Dates	FM + WML1yr + MGMLG	FM + HGMLG	FM + WML2mth + PtopMU	FM + WML1yr	FM + PtopMU	FM + WML2mth + MGMLG
2010/01	0.0039	-0.0070	0.0112	0.0021	0.0040	0.0058
2010/02	0.0185	0.0102	0.0290	0.0218	0.0239	0.0218
2010/03	0.0197	0.0135	0.0311	0.0239	0.0223	0.0262
2010/04	-0.0066	-0.0169	-0.0072	-0.0092	-0.0192	-0.0043
2010/05	-0.0171	-0.0237	-0.0179	-0.0205	-0.0287	-0.0177
2010/06	0.0014	-0.0034	-0.0023	0.0048	-0.0038	-0.0021
2010/07	0.0360	0.0303	0.0371	0.0392	0.0411	0.0347
2010/08	0.0178	0.0026	0.0269	0.0216	0.0322	0.0128
2010/09	0.0064	0.0001	0.0173	0.0119	0.0019	0.0146
2010/10	0.0242	0.0132	0.0270	0.0275	0.0140	0.0319
2010/11	0.0082	0.0050	0.0175	0.0107	0.0119	0.0093
2010/12	0.0091	0.0010	0.0070	0.0139	0.0033	0.0063

Appendix G5

Dates	FM + MGMLG	FM + WML2mth
2010/01	-0.0027	0.0045
2010/02	0.0150	0.0258
2010/03	0.0162	0.0321
2010/04	-0.0156	-0.0064
2010/05	-0.0284	-0.0213
2010/06	-0.0035	0.0005
2010/07	0.0381	0.0376
2010/08	0.0146	0.0153
2010/09	-0.0015	0.0222
2010/10	0.0202	0.0371
2010/11	0.0017	0.0121
2010/12	0.0025	0.0105