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Value Investing with Quality in the US Public Insurance Companies

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Abstract

This study explores the value investing strategy coupling with quality metrics for the U.S. insurance industry. It uses apparent measures of insurance company efficiency such as loss ratio, expense ratio, combined ratio, and investment yield to construct portfolios. There are evidences of value premium as measured by PB and PE ratios. It is not clear that the quality metrics can give superior returns for investors. The anomalies can partially be explained by Fama-French five-factor model (FF5)'s market factor, value factor and profitability factor. The study also proposes using a new five-factor model that changes the profitability (quality) factor slightly from the Fama-French five-factor model. The adjusted FF5 "local" using insurance local factors do not improve the ability to explain the portfolios' returns.

Keywords: Value Investing; Quality Investing; Portfolio Management; Life Insurance; Property and Casualty Insurance; Risk Management.

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1 Introduction

Dodd and Graham (1951), and Graham (2003) propose "value" strategy for investing. Investors can outperform the stock market by constructing a portfolio consisting of stocks with low price-to-book ratios (PB) or low price-to-earning ratios (PE). Following Benjamin Graham's value philosophy, various studies also find evidences of value anomaly. Basu (1977) uses PE ratio to define value portfolio and find that value portfolio outperforms growth portfolio and the market. Fama and French (1992, 1993, 1996, 1998, 2006a,b, 2012, 2015) find that portfolios of value stocks, which defined as having low PB, tend to outperform the market. Asness, Moskowitz, and Pedersen (2013) use various asset and various method to define value. They find that value portfolio outperforms growth portfolio and the general market in various asset classes not only in the US, but also in other countries. Nettayanun (2017) finds that using value approach to investing specifically in the Thai insurance industry can outperform the growth stocks and the market. Overall, value investing strategy outperforms the market even focusing on a particular industry. This study takes another twist from previous literatures. It complements value investing for insurance industry with quality consideration.

Piotroski (2000) constructs portfolios with quality and shows that high quality stocks outperform low quality ones. He constructs F-score using various accounting measure and find that F-score helps value portfolio achieve even higher performance. Novy-Marx (2013) uses gross profitability as a sign of quality to increase performance of value portfolio. Firms with higher gross profitability over assets tend to outperform the lower ones. Fama and French (2012, 2015) use operating profit over assets to show that investing in profitable firms also outperforms the market. Similar to Novy-Marx (2013), the study conducts the same analysis. However, Novy-Marx (2013) excludes financial firms into his analysis. This is due to the fact that he wants to find a measure that works across most stocks. Gross margin is not suitable in the insurance company. In addition, financial industries have quite different characteristics from others.

According to Cummins, Weiss, and Zi (1999) and Nettayanun (2014), every insurance company has three main operations. First, it pools and bears underwriting from large amount of similar risks. Second, insurer serves its customers through servicing by providing information, and when losses occur. Third, it acts as financial intermediary between customer and investment asset. It invests premium in various classes of assets. Therefore, this study specifies which quality measures for insurance stocks according to this value chain. It uses loss ratio to capture the first element of operation. It uses expense ratio to capture the servicing part. It also takes combined ratio into account for the first and second operations. Finally, investment yield captures the intermediary element.

Combined ratio is one of the most favored metrics for measuring the quality of insurance companies. Warren Buffett and Prem Watsa, two of the most well-known value investors in the insurance industry, are very vocal about the importance of underwriting profit. An insurance company can have a sustained competitive advantage by properly pricing insurance policies. For example, Warren Buffett, one of the famous value investors who invests in many insurers stated that:

> *'At bottom, a sound insurance operation needs to adhere to four disciplines. It must (1) understand all exposures that might cause a policy to incur losses; (2) conservatively evaluate the likelihood of any exposure actually causing a loss and the probable cost if it does; (3) set a premium that will deliver a profit, on average, after both prospective loss costs and operating expenses are covered; and (4) be willing to walk away if the appropriate premium can't be obtained. Many insurers pass the first three tests and flunk the fourth. They simply can't turn their back on business that their competitors are eagerly writing. That old line, "The other guy is doing it so we must as well," spells trouble in any business, but in none more so than insurance. Indeed, a good underwriter needs an independent mindset akin to that of the senior citizen who received a call from his wife while driving home. "Albert, be careful," she warned, "I just heard on the radio that there's a car*

going the wrong way down the Interstate." "Mabel, they don't know the half of it," replied Albert, "It's not just one car, there are hundreds of them."[1] *'*

In the same vein as Buffett, Prem Watsa also often stated in his annual letter to shareholders, for example:

> *"Float is essentially the sum of loss reserves, including loss adjustment expense reserves, and unearned premium reserves, less accounts receivable, reinsurance recoverables and deferred premium acquisition costs. Our long term goal is to increase the float at no cost, by achieving combined ratios consistently at or below 100%. This, combined with our ability to invest the float well, is why we feel we can achieve our long term objective of compounding book value per share by 15% per annum. In the last ten years, our float has cost us nothing (in fact, it provided a 0.8% benefit per year) significantly less than the 3.3% that it cost[s] the Government of Canada to borrow for ten years.*[2] *"*

However, there is no proof yet whether the qualities preached by the experts translate to superior investment returns. This paper investigates the stock price returns of insurance companies with good quality metrics such as a combined ratio.

Are insurance companies with better quality metrics also better investments?

Quality Factors for Insurance Companies

To capture the efficiency and profitability of insurance companies, we define 4 quality factors which are easily obtained from accounting report and widely used in the industry: loss ratio, expense ratio, combined ratio, and investment yield. Loss ratio is defined as Benefits and Claims (BCT) divided by Insurance Premiums (IPTI). This ratio reflects an insurance company's competency in the underwriting business. The numerator (BCT) represents the

[1]See the 2011 Warren Buffett's Letter to Berkshire Shareholders of Berkshire Hathaway Inc.

[2]See the 2015 Prem Watsa's Letter to Berkshire Shareholders of Fairfax Financial Holdings Limited.

amount that insurer has to pay for clients for a particular year. The denominator (IPTI) represents premium each insurer collects in a particular year. Therefore, a more profitable company tends to aim for a lower loss ratio. In the same vein as loss ratio, expense ratio is defined by Underwriting Expense (XUWTI) divided by Insurance Premiums (IPTI). The numerator is adjusted by using underwriting expense (XUWTI). Expense ratio represents how much an insurer has to pay for other items besides claims. Again, a more profitable insurer aims for a lower expense ratio. Combined Ratio is defined by Loss Ratio added by Expense Ratio. The combined ratio represents both claim payments including loadings. If combined ratio is less than 100%, an insurer has underwriting profit in the year. Therefore, the smaller the combined ratio, the more profitable the insurer is. Investment Yield is defined by Investment Income (IVI) added by Capital Gain (CGTI) for investment returns and then divided by Investment Assets (IATI). The measure captures the quality of an insurer's investment portfolio. We assume that higher yield represents more quality of its manager to invest. Though, it might be better to get the risk-adjusted return for the investment portfolio. However, due to data limitation, it is impossible to get the measure of risk from each insurer's portfolio.

The results are interesting for the insurance industry. First, value stocks, as measured by price to earnings and price to book ratios, do not show signs of beating growth stocks. Second, high quality insurers, those with low loss ratios, low expense ratios and low combined ratios, do not outperform low quality insurers. However, insurers with low investment yield outperform those with high investment yield. In addition, the returns of all portfolios can partially be explained by the Fama-French 5 factor model(FF5). We adjust the FF5 using the "local" HML and RMW factors which are factors derived from only insurance data. The local factors do not show significant sign of improvement to the FF5. Therefore, FF5 are sufficient to explain the return of portfolios consisted of insurance companies.

The study proceeds as follows. Section II outlines portfolio construction procedures and how the study collects the data. Section III reports performances of various portfolios using several value and quality measures. Section IV uses Fama-French 5 factor model to explain the portfolio returns. Section V adjusts FF5 model with the HML and RWM factors from insurance related data. Section VI explains the value premium and quality using bond yields. Lastly, we conclude the study and give some further recommendations for future researches.

2 Portfolio Construction and Data Collection

First, the study constructs portfolios base on value dimension of companies using low PB ratio and low PE ratio. We sort stocks based on these ratios. Then it splits insurance stocks into tertile; low, medium, and high. This is due to the fact that there are only about 200 insurance stocks, on average, from 1990 to 2014. Therefore, using only 3 portfolios for value dimension seem reasonable. If there are more than 3 portfolios, there might be some cases that stocks do not fall in a portfolio when we construct a 2-dimensional portfolio. Second, we construct portfolio based on various quality measures specifically for insurance industry, which are loss ratio, expense ratio, combined ratio, and investment yield. Again, we split stocks into tertile based on quality measures. Third, we test whether quality increases performance of value portfolio. We can achieve this by constructing a 3 by 3 matrix based on the sorting of 1) value dimension and 2) quality dimension.

The authors acquire the fundamental data using Compustat database. The dataset is available from 1950. However, the insurance stocks happen to appear in the beginning of 1982. So the authors decide to start using the data from 1990 to get adequate insurance stocks[3]. The monthly stock returns are from CRSP that links with compustat data via gvkey variable. For each portfolio construction, the study gives some information for the portfolios which are cumulative annual growth rate (CAGR), minimum of portfolio returns, maximum of portfolio returns, standard deviation of portfolio returns, value at risk at 5 % of portfolio returns, and average monthly returns.

[3]The NAIC data is also available from 1980's which some of them are not quite complete either. Therefore, to be safe, we start using the data from 1990.

2.1 Portfolio construction

Portfolios rebalance themselves at the end of June each year to take into account the time investor has to absorb the information before investing from previous calendar year's fundamental data which should publish in March and April of each year. So the sorting of each "value" and "quality" factor happen at the end of June in each year. Variables related to quality such as loss ratio, expense ratio, combined ratio, and investment yield will be constructed. The returns of the market index will also be used to benchmark portfolios' return from Kenneth French website. When stocks disappear between rebalancing period, we take that position as cash in the portfolio. In addition, we adjust the number of shares changed during the portfolio holding period. The analysis eliminates company when there is a missing data.

3 Results

This section provide results from our analysis. First it discusses the results from constructing portfolios from value and quality metrics.

3.1 Performance of PE and PB ratios

Table 1 and table 2 show that insurance stocks with low PB or low PE outperform those with high PB or PE. This value premium is consistent with findings of the likes of Fama and French (1993), Fama and French (1998), Fama and French (2012) and Fama and French (2015) . However, in our result, PE ratio shows a greater wedge between the high tier and the low tier.

Table 1

PB	CAGR (%)
Low	15.71
Medium	14.00
High	13.71

Table 2

PE	CAGR (%)
Low	17.14
Medium	14.37
High	12.12

3.2 PB and Quality

Table 3 shows various results from constructing portfolio of value and quality. The value measure is the price to book ratio. The quality measures are loss ratio, expense ratio, combined ratio and investment yield. Table 3 provides various portfolio characteristics including CAGR, monthly average, minimum and maximum, standard deviations, and value at risk at 95% of returns from the portfolio constructed.

According to table 3, the performances from the PB and loss ratio are not clear. The highest CAGR is at the top right corner of the table and also on the middle left of the table. The lowest CAGR is at the top left corner of the table. The results are the same for average monthly return. This suggests that cheap and quality, in term of loss ratio, insurance stocks seems to provide provide lowest returns to investors. Though, the risks are similar throughout various portfolios.

Using expense ratio as quality measures, the results are in the same vien as using loss ratio. The lowest CAGR is at the highest PB and the highest expense ratio. This implies stocks that are expensive and low quality in term of expense ratio exhibit lowest return. Though, similar to using loss ratio, the trend of returns are not clear for monthly returns and CAGR. The pattern is also the same for using PB and combined ratio. The lowest returns are at the left top corner and the right bottom of the table. Therefore, most cheap stock and low combined ratio stock exhibit lowest returns. The low quality portfolio in term of combined ratio and expensive stocks are also show low CAGR and average monthly returns.

Looking at risk using standard deviation and value at risk. The results show interesting trends. The higher rows tends to exhibit more risk than the lower ones. This might imply that low PB stocks are in distress and we can explain value portfolio using value premium similar to risk story in Zhang (2005).

Interestingly, the results from PB and investment yields exhibit a trend. According to table 3, the highest CAGR is at the top left corner of the table. A portfolio consisted of low PB and low investment yield seems to outperform the others. This implies that cheap and low quality, using investment yield, gives the best investment strategy. On the other hand, a portfolio at the bottom right corner which is expensive and high yield give lowest return. This can be explained by: first, the bond yields from the previous decades tended to decline. Low investment yield portfolio benefit from the rise of bond yield. Second, high investment yield will be those insurers that invest more portion in stocks rather than bonds. Therefore, these companies might be percieved from investor as risky. Hence, they tried to avoid them especially when the financial crisis arose.

Overall, the results do not show that investing in cheap and quality stocks can outperform the expensive and low quality stocks. There is no clear "value" premium from the PB perspectives.

3.3 PE and Quality

According to table 4, the value measure is the price to earnings ratio. The quality measures are loss ratio, expense ratio, combined ratio and investment yield. Table 4 provides various portfolio characteristics including CAGR, monthly average, minimum and maximum, standard deviations, and value at risk at 95% of returns from the portfolio constructed.

According to table 4, we can see the “value” premium across all quality measures. The CAGR and average monthly returns are higher at upper rows. Therefore, PE seems to be a measure that capture value factor better than the PB ratio. The result is similar to Nettayanun (2017) where value portfolio via PE ratio gives higher value premium than PB ratio.

In term of quality measure, the results are mixed. Using loss ratio, expense ratio, and combined ratio as a quality measure, the table shows interesting results. The higher returns are at the top right and bottom left corner of the table. This implies that a portfolio with cheap and low quality and a portfolio with expensive and high quality outperform other portfolios. On the contrary, the lowest returns are at the top left and bottom right corner which implies a cheap and high quality portfolio and an expensive and low quality portfolio underperform the others. This is in the opposite of our hypothesis that cheap and good company should exhibit higher returns.

In addition, investment yield seems to be the quality measure that extracts portfolio returns. More specifically, low-PE and low-investment-yield portfolios outperformed other portfolios, contrary to the perception that insurers with high investment yields are better investments. Similar to the PB case, low bond yields from the last decade provided the incentive to invest in bond instead of stock.

Overall, using PE gives higher value premium than the PB ratio. In addition, low investment yield coupling with low PE ratio seems to exhibit higher CAGR and monthly return for insurance portfolios. Other quality measures do not show satisfactory results to be called quality premium.

4 The Explanation of Portfolios Using Fama-French 5 Factor Model

We regress the excess returns of the portfolios from risk free rates on factors such as Fama-French 5 factor model to verify whether these factors explain the portfolio excess returns. We expect the value and profitability factor should explain the constructed portfolios. Then we use Fama-French 5 factor model to explain them. Basically, this is the OLS of the following variables,

$$R_p(t) - R_f(t) = \alpha + \beta_M[R_{Market}(t) - R_f(t)] + \beta_S * R_{SML}(t) + \beta_H * R_{HML}(t) + \beta_R * R_{RMW}(t) + \beta_C * R_{CMA}(t) + \epsilon(t). \tag{1}$$

$R_p(t)$ are returns of the portfolio at time t using PB and other measures of quality. $R_f(t)$ are returns of the risk-free rate. $R_{Market}(t)$ are returns of the market at time t. $R_{SML}(t)$ are returns of the size factor at time t. This size factor is created from finding the returns of the smallest quintile firms subtracted by the returns of the largest quintile firms. This factor can be acquired from Kenneth French website. $R_{HML}(t)$ are returns of the value factor at time t. $R_{CMA}(t)$ are returns of the investment factor at time t. $R_{RMW}(t)$ are returns of the profitability factor at time t. The Market, SML, HML, CMA, and RMW factors can be acquired from Kenneth French website. The table gives coefficients and their t-statistics. R^2 and p-value also present in the tables. (These numbers are just an illustration.)

Table 5 represents the coefficients of portfolios constructed from PB ratio and quality measures. Table 7 shows the coefficients of portfolios constructed from PE ratio and quality measures. Table 6 gives t-value for each coefficient corresponding to the Fama-French 5 factor model of portfolios using PB ratio. Table 8 gives t-value for each coefficient corresponding to the Fama-French 5 factor model from portfolio constructed by PE ratio.

According to table 5 and table 6, market factor and value factor explain the returns of the portfolios for the PB portfolios. The market factor explains most of the portfolios' returns. In particular, the value factor explains the value portfolios in all quality measures. The profitability factor also explains the returns of the portfolios as we expected.

According to table 7 and table 8, market factor and value factor also explain the returns of the portfolios using PE. The market factor explains most of the portfolios. In particular, the value factor explains the value portfolios in all quality measures. The profitability factor also explains the returns of the portfolios as well. This is especially for growth portfolios[4].

Therefore, market factor, value factor and profitability factor from Fama-French 5 factor model can explain the insurance portfolio as we expect. Next section, we investigate further by using adjusted Fama-French 5 factor model. The model will adjust value and profitability factors using only insurance data. Various studies argue that using only stocks that are very related to the portfolio can explain the returns better. So we use PB and PE to construct our own value factor. In addition, we use loss ratio, expense ratio, combined ratio and investment yield to construct profitability factor.

5 The Explanation of Portfolios Using Adjusted Fama-French 5 Factor Model

Similar to previous section, we regress the excess returns of the portfolios from risk free rates on factors such as Fama-French 5 factor model to verify whether these factors explain the portfolio excess returns. However, we adjust the value and the profitability factors by using industry specific factors. Basically, this is the OLS of the following variables,

$$R_p(t) - R_f(t) = \alpha + \beta_M[R_{Market}(t) - R_f(t)] + \beta_S * R_{SML}(t) + \beta_H * R_{HML:INS}(t) + \beta_R * R_{RMW:INS}(t) + \beta_C * R_{CMA}(t) + \epsilon(t). \tag{2}$$

$R_p(t)$ are returns of the portfolio at time t using PB and other measures of quality. $R_f(t)$

[4]portfolio at the middle and bottom rows

are returns of the risk-free rate. $R_{Market}(t)$ are returns of the market at time t. $R_{SML}(t)$ are returns of the size factor at time t. This size factor is created from finding the returns of the smallest tertile firms subtracted by the returns of the largest tertile firms. This factor can be acquired from Kenneth French website. $R_{HML:INS}(t)$ are returns of the value factor at time t using only insurance companies instead of the whole stock market sorting. More specifically, we use PB and PE as the sorting variable for insurance companies in our sample. $R_{CMA}(t)$ are returns of the investment factor at time t. $R_{RMW:INS}(t)$ are returns of the profitability factor at time t using only insurance companies instead of the whole market sorting. We employ loss ratio, expense ratio, combined ratio and investment yield for the profitability factor sorting. The Market, SML, HML, CMA, and RMW factors can be acquired from Kenneth French website. The table gives coefficients and their t-statistics. R^2 and p-value also present in the tables.

According to Table 9, the adjusted FF5 does not improve the explanation of returns of various portfolios. For example, R^2 of the lowest tertile loss ratio and the lowest tertile PB is 34.30% for FF5 while it is 42.65% for the adjusted FF5. However, R^2 of the middle loss ratio tertile and the middle PB tertile is 49.49% for FF5 while it is 44.34% for the adjusted FF5. Hence, by using the adjusted FF5 for loss ratio and the PB ratio does not improve the power of explanation of portfolios' returns using R^2 as the goodness of fit criteria.

In addition, we expect that the t-statistics of the value and the quality factors should be higher for the adjusted FF5. According to Table 9, the numbers do not align with the expectation. For example, using the third factor, the t-statistics for the lowest tertile loss ratio and the lowest tertile PB is 3.23 for FF5 and 7.78 for adjusted FF5. However, the t-statistics for the highest tertile loss ratio and the lowest tertile PB is 9.00 for FF5 and 6.63 for adjusted FF5. Therefore, t-statistics of the adjusted FF5 are not always greater than t-statistics of the original FF5. The results are not conclusive. The results are the same for the combination of PB and expense ratio (Table 10), PB and combined ratio (Table 11), PB and investment yield (Table 12), PE and loss ratio (Table 13), PE and expense ratio (Table

14), PE and combined ratio (Table 15) and PE and investment yield (Table 16).

6 Conclusions and Discussions

This paper concerns investments in insurance companies and we want to answer the question: Is an insurance company with better quality metrics (such as combined ratio) a better investment? According to our study the findings are interesting. First of all, value premium is not obvious using PB ratio. However, using PE ratio, there exists value premium in the US publicly insurance traded stocks. Using loss ratio, expense ratio, combined ratio, does not represent quality premium. However, using investment yield does actually show signs of quality premium for insurers. Though, low investment yield results in higher returns for insurance stocks.

What do we learn from the study? First of all, PE ratio might be the value metric that investors need to consider rather than the PB ratio. However, investing in either low loss ratio, low expense ratio, or low combined ratio does not yield higher returns as previously and widely believed. It is possible that the market has already factored in these ratios.

Why do Warren Buffett and Prem Watsa emphasize (low) loss, expense, and combined ratios? The cost of float tends to be cheap when the combined ratio is low. Buffett and Watsa use their floats to boost the return on their investments in the long run. Therefore, a low combined ratio may not generate superior returns unless the company has a good investment strategy to go with it.

According to previous study such as Frazzini, Kabiller, and Pedersen (2013), recent returns of Buffett's portfolio are lower than previous decades. However, Berkshire Hathaway still get high rate of return on the book value. This is the result from cheap float for boosting leverage and investment return.

Value investors might argue that GEICO investment by Berkshire in 1976 was an example of investing in a value and quality insurer. This was true because it gave high rate of return for Berkshire Hathaway about 3-4 years after it first invested in GEICO. However, investor has to realize that Berkshire Hathaway invested in both common stocks and preferred shares according to Schroeder (2009). Berkshire Hathaway helped GEICO steered clear of trouble during the period when GEICO had a reserve problem. Retail investors might not be able to inject capital through preferred shares like Buffett did.

Predictability in the insurance industry is another key issue that might lead to the narrow value premium. Investor might not be able to take an advantage of earning predictability. This is due to the fact that insurance company can adjust reserve corresponding to its in house calculation. For example, increasing in reserve for a life company by adjusting some parameters can yield very negative earning. Investor can get panic and sell the shares due to a surprise reserve adjustment. Even low PB or PE insurance stocks can go even lower if there is a reserve adjustment shock.

In conclusion, investor might be misguided and invests in the insurance company with good quality by looking at loss ratio, expense ratio and combined ratio. At least from the result of this study suggests, there is no clear quality premium on those metrics. This might be due to the fact that the market is already fully priced in the value and quality factors into the insurance stocks. Therefore, investor might not be able to take advantage of these anomalies.

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Table 3: PB and Quality Portfolio

	PB+Loss			PB+Exp			PB+Comb			PB+InvYield	
CAGR	CAGR	CAGR	CAGR	CAGR	CAGR	CAGR	CAGR	CAGR	CAGR	CAGR	CAGR
9.9619	14.5275	15.9753	13.816	15.2756	14.6658	8.2977	17.996	16.1738	16.3363	16.0017	11.964
15.5976	12.4046	13.5983	15.4593	11.6543	13.1797	12.7669	15.469	11.5638	11.4471	13.9113	16.311
13.3234	12.9514	12.7248	14.4542	13.6128	10.5734	14.1842	14.5677	10.7439	14.3903	12.5019	9.6682
Avg	Avg	Avg	Avg	Avg	Avg	Avg	Avg	Avg	Avg	Avg	Avg
0.7763	1.08	1.3235	1.1449	1.1766	1.1445	0.7556	1.3089	1.3056	1.314	1.2828	0.8982
1.113	0.8603	1.1271	1.1226	0.8306	0.9988	0.9256	1.0904	0.9116	0.832	1.0125	1.1544
0.9381	0.903	0.9979	1.0296	0.9896	0.8039	0.9902	1.0427	0.8891	1.0251	0.8974	0.6681
Min	Min	Min	Min	Min	Min	Min	Min	Min	Min	Min	Min
-24.9028	-28.5417	-32.5375	-29.2514	-22.6268	-30.2332	-27.6685	-24.046	-33.1208	-32.1798	-30.0941	-20.6715
-15.0073	-19.1196	-49.3214	-21.303	-22.243	-30.7199	-19.4821	-18.6355	-39.7852	-20.1668	-23.0652	-18.6272
-15.9758	-18.3041	-23.02	-19.1916	-26.3066	-31.9462	-15.5783	-19.5206	-31.5446	-17.3944	-21.7558	-19.6347
Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max
47.7007	30.6384	36.5978	31.0764	41.186	38.6589	47.7007	37.5623	33.5395	42.5484	37.6362	25.7835
23.3352	14.5158	36.8648	22.4716	23.0784	28.4077	27.6755	21.131	29.2655	21.4499	19.5867	24.2803
19.8399	31.3047	26.5291	25.3697	24.5604	27.0235	21.0512	28.9237	30.8757	24.6288	24.5053	29.221
SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD
6.7494	6.0677	8.025	7.7335	6.8136	6.9298	8.3417	5.7513	7.5914	7.6369	7.5154	6.2146
5.281	4.893	7.4725	5.6088	5.4023	6.2641	5.6691	4.9879	6.6993	5.7241	5.6514	5.0568
5.1193	4.9794	6.8632	5.2687	5.6643	6.329	4.8894	5.3723	7.4222	5.2806	5.4916	5.2656
Var95	Var95	Var95	Var95	Var95	Var95	Var95	Var95	Var95	Var95	Var95	Var95
-10.892	-8.7633	-11.0043	-10.7579	-9.2671	-10.4177	-11.4279	-7.3013	-10.6743	-11.0765	-9.6018	-9.4037
-7.0964	-7.779	-8.9871	-8.4657	-7.5076	-8.9857	-8.2891	-7.5506	-9.3462	-8.9017	-7.6436	-6.4949
-8.5597	-7.0942	-9.5475	-6.8171	-8.22	-10.1986	-7.2905	-7.3311	-10.6748	-7.7779	-7.5075	-7.2403

Note: The table shows CAGR, monthly average return, minimum and maximum of returns, standard deviations of returns and value at risk at 95% of returns from the portfolio constructed using the price to book and quality measures. The quality measures are loss ratio, expense ratio, combined ratio and investment yield.

Table 4: PE and Quality Portfolio

	PE+Loss			PE+EXP			PE+Comb			PE+InvYield	
CAGR	CAGR	CAGR	CAGR	CAGR	CAGR	CAGR	CAGR	CAGR	CAGR	CAGR	CAGR
19.4434	13.5735	17.4933	11.788	17.7525	18.4614	17.1615	16.0086	19.0658	21.3527	14.9877	15.5671
10.6131	18.4446	13.2067	14.8442	13.4137	12.4076	12.1501	15.5477	12.7918	14.2556	14.7469	13.4482
11.7976	10.4724	14.3395	13.9744	10.6826	7.7816	10.2144	15.7026	8.1669	11.5907	12.4892	10.5514
Avg	Avg	Avg	Avg	Avg	Avg	Avg	Avg	Avg	Avg	Avg	Avg
1.4333	0.9741	1.4694	0.8942	1.3027	1.4286	1.2532	1.1693	1.5567	1.5998	1.1752	1.1269
0.7249	1.3381	1.0858	1.0627	0.9846	0.9418	0.8557	1.1111	1.0949	1.042	1.0739	0.9818
0.8603	0.7429	1.1063	1.015	0.754	0.6184	0.7396	1.1126	0.6696	0.8396	0.9351	0.7781
Min	Min	Min	Min	Min	Min	Min	Min	Min	Min	Min	Min
-17.0583	-18.2623	-32.348	-22.7239	-16.1842	-28.3193	-15.5253	-21.7423	-32.2526	-22.279	-22.3908	-18.5439
-18.1468	-18.3881	-39.4684	-20.1437	-17.1974	-28.8888	-14.7872	-21.8369	-37.6005	-19.8441	-22.4747	-22.2422
-19.3718	-20.0758	-30.2702	-19.4344	-14.5237	-33.6058	-20.385	-17.7598	-34.3213	-22.2143	-29.0827	-22.243
Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max
23.4331	19.9479	61.5332	22.4922	22.8733	62.3279	24.639	27.4348	63.0511	46.3629	35.6134	24.8412
22.6671	42.2526	32.348	23.251	37.3748	27.6014	26.0954	29.1216	36.55	39.0074	33.2512	33.468
25.337	26.2804	21.777	25.5369	21.5789	22.2892	31.2776	24.3141	25.0101	28.3635	23.1676	18.2645
SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD
6.0707	5.4358	8.7079	6.3773	5.8962	7.2784	5.8018	5.7524	8.4338	6.6773	7.0593	5.5755
4.9208	5.7489	7.4195	5.3101	5.9693	6.316	5.2339	5.3205	8.0115	5.8169	5.7139	5.7515
5.7993	5.4641	6.6224	5.635	5.393	6.7069	5.7837	5.1094	7.027	5.6985	6.0845	5.9466
Var95	Var95	Var95	Var95	Var95	Var95	Var95	Var95	Var95	Var95	Var95	Var95
-8.7521	-8.1062	-11.1061	-8.9424	-8.3536	-9.6199	-8.4351	-7.5235	-10.6746	-8.0549	-9.4731	-7.4601
-7.402	-6.6423	-11.5158	-7.6181	-7.9695	-9.3053	-8.5248	-6.2093	-11.8333	-8.1756	-9.0622	-7.3818
-8.5616	-8.2883	-9.0115	-8.2698	-7.933	-9.7861	-9.1605	-7.0416	-9.8102	-7.9613	-7.0959	-9.2518

Note: The table shows CAGR, monthly average return, minimum and maximum of returns, standard deviations of returns and value at risk at 95% of returns from the portfolio constructed using the price to earnings and quality measures. The quality measures include loss ratio, expense ratio, combined ratio and investment yield.

Table 5: Explanation of Portfolio Anomly Using Fama-French 5 Factor Model - PB

	PB+LOSS			PB+EXP			PB+COMBINED			PB+INVYIELD	
	R^2			R^2			R^2			R^2	
34.3031	48.2274	59.9426	43.8861	52.3092	56.7021	26.4946	49.7122	61.2633	43.3777	54.8921	56.5524
45.9167	49.4935	60.5355	50.3915	46.5873	58.7411	44.9688	51.3173	62.6229	54.4154	59.427	48.7595
44.9855	52.3194	51.4745	56.9851	37.9385	54.6369	49.8252	45.2059	55.8912	51.4281	52.1512	52.5443
	α			α			α			α	
-0.0575	0.128	0.1675	-0.0426	0.2199	0.1933	-0.2365	0.5015	0.1576	0.4319	0.0837	-0.0016
0.1894	-0.0349	-0.0052	0.1233	-0.0715	-0.0661	-0.06	0.2152	-0.1936	-0.1608	-0.0147	0.2996
0.0413	0.1479	-0.0862	0.1171	0.1795	-0.2656	0.1184	0.2438	-0.289	0.1186	-0.009	-0.2243
	Market			**Market**			**Market**			**Market**	
0.8914	0.9312	1.2461	1.1614	1.0314	1.0252	0.9968	0.845	1.2162	0.9389	1.2232	0.9823
0.8809	0.8254	1.2722	1.021	0.8896	1.0817	0.9108	0.9011	1.1665	1.0373	1.0073	0.8268
0.8914	0.8644	1.2384	0.9715	0.8889	1.1568	0.8884	0.8847	1.3602	0.9576	0.9902	0.9568
	SMB			**SMB**			**SMB**			**SMB**	
0.3352	0.2295	0.4112	0.3884	0.1807	0.4682	0.406	0.1459	0.4386	0.2378	0.3023	0.3081
0.1911	0.2569	0.2454	-0.0135	0.3143	0.272	0.1746	0.1576	0.2979	0.0747	0.2524	0.2644
0.0486	-0.2089	-0.078	-0.0956	0.005	0.1126	-0.0265	-0.0725	-0.0262	-0.0175	-0.0854	-0.012
	HML			**HML**			**HML**			**HML**	
0.498	0.7108	1.2855	0.7148	0.9808	1.0295	0.2898	0.8473	1.1409	1.1774	0.9466	0.875
0.3675	0.3571	0.9877	0.3189	0.3525	0.7629	0.4789	0.2842	0.8808	0.4844	0.6396	0.4382
0.227	0.4486	0.4487	0.4617	0.2552	0.4741	0.2561	0.4092	0.6136	0.3524	0.3912	0.3715
	RMW			**RMW**			**RMW**			**RMW**	
0.2611	0.2622	0.1327	0.346	0.0984	0.104	0.1859	0.1805	0.1541	-0.0983	0.2686	0.2466
0.5851	0.3637	0.167	0.4757	0.4788	0.3317	0.584	0.387	0.2331	0.5043	0.4244	0.3216
0.5251	0.3326	0.4714	0.5227	0.4846	0.3982	0.5159	0.4374	0.4552	0.455	0.5029	0.4899
	CMA			**CMA**			**CMA**			**CMA**	
-0.0738	0.1523	-0.3543	0.2495	-0.0754	-0.3591	0.5051	-0.1415	-0.2255	-0.1128	0.0924	-0.3611
0.107	0.3753	-0.1372	0.4034	0.0598	0.0445	0.176	0.2376	-0.0117	0.0777	0.0935	0.1924
0.3036	0.0768	0.1363	0.0652	0.0449	0.1965	0.2603	-0.0114	0.0217	0.2052	0.0821	0.0875

Note: The table shows the coefficients from the Fama-French 5 factor model. The portfolios are constructed from the price to book and the quality measures. The quality measures include loss ratio, expense ratio, combined ratio and investment yield. R^2's are also included in the table for each portfolio formulated.

Table 6: T-values of Each Parameter from the Fama-French 5 Factor Model - PB

	PB+LOSS			PB+EXP			PB+COMBINED			PB+INVYIELD	
	$t-\alpha$			$t-\alpha$			$t-\alpha$			$t-\alpha$	
-0.1697	0.4735	0.5324	-0.1188	0.7547	0.6844	-0.534	1.9854	0.5387	1.2136	0.2679	-0.0061
0.7874	-0.1619	-0.0179	0.5041	-0.2923	-0.2651	-0.2305	0.9987	-0.7634	-0.672	-0.0659	1.3364
0.1755	0.6948	-0.2913	0.5472	0.6496	-1.0061	0.5521	0.9899	-0.9466	0.5205	-0.0382	-0.9987
	$t-Market$			$t-Market$			$t-Market$			$t-Market$	
9.7921	12.8177	14.7437	12.0475	13.1727	13.5113	8.3761	12.4507	15.4688	9.819	14.5636	14.4109
13.6306	14.2648	16.2872	15.5312	13.5412	16.1566	13.0155	15.5591	17.1164	16.1302	16.8168	13.7263
14.1076	15.1085	15.567	16.8959	11.9717	16.3084	15.4154	13.3687	16.5828	15.637	15.6653	15.8512
	$t-SMB$			$t-SMB$			$t-SMB$			$t-SMB$	
2.8801	2.4702	3.8048	3.1513	1.8045	4.8258	2.668	1.6815	4.3624	1.9447	2.8145	3.5353
2.312	3.4716	2.4572	-0.1601	3.7417	3.1771	1.9507	2.1283	3.4183	0.9089	3.2954	3.4327
0.6018	-2.8552	-0.7665	-1.3004	0.0529	1.2419	-0.3592	-0.857	-0.2499	-0.2237	-1.0569	-0.1553
	$t-HML$			$t-HML$			$t-HML$			$t-HML$	
3.2361	5.7878	8.9973	4.3862	7.41	8.0259	1.4405	7.3854	8.5844	7.2838	6.6672	7.5934
3.3642	3.651	7.4798	2.8695	3.1743	6.7404	4.0479	2.9026	7.6448	4.456	6.3163	4.3039
2.1255	4.6383	3.3367	4.7494	2.0332	3.954	2.6289	3.658	4.4255	3.404	3.661	3.6409
	$t-RMW$			$t-RMW$			$t-RMW$			$t-RMW$	
1.6909	2.1279	0.926	2.1162	0.7409	0.8081	0.9213	1.5682	1.156	-0.6064	1.8859	2.1334
5.3385	3.7057	1.2603	4.2668	4.2975	2.9209	4.9208	3.9398	2.0168	4.624	4.1778	3.148
4.9005	3.4279	3.494	5.3598	3.8478	3.3098	5.2782	3.8975	3.2723	4.381	4.6914	4.786
	$t-CMA$			$t-CMA$			$t-CMA$			$t-CMA$	
-0.3385	0.8754	-1.7503	1.0806	-0.4018	-1.9762	1.7719	-0.8704	-1.1973	-0.4926	0.4595	-2.2119
0.6914	2.7077	-0.7332	2.5622	0.3802	0.2776	1.0499	1.713	-0.0716	0.5047	0.6518	1.3333
2.0061	0.5603	0.7155	0.4731	0.2527	1.1563	1.8859	-0.072	0.1103	1.3989	0.5424	0.6056

Note: The table shows the t-statistics from the Fama-French 5 factor model. The portfolios are constructed from the price to book and the quality measures. The quality measures include loss ratio, expense ratio, combined ratio and investment yield. R^2's are also included in the table for each portfolio formulated.

Table 7: Explanation of Portfolio Anomly Using Fama-French 5 Factor Model - PE

	PE + Loss			PE + EXP			PE + COMBINED			PE+INVYIELD	
	R^2			R^2			R^2			R^2	
37.5606	44.842	48.9892	48.6649	52.1367	45.4612	40.3591	43.5261	47.1067	46.0484	51.8329	51.2845
46.731	43.1465	60.4991	51.0176	47.5196	63.4622	43.5724	47.3713	61.7988	49.2417	58.4382	53.2135
39.9689	53.8066	61.7429	54.4416	46.6436	57.2668	42.4693	50.8024	59.7378	57.1328	60.9874	45.3527
	α			α			α			α	
0.6723	0.0124	0.4204	-0.1236	0.3142	0.5928	0.4202	0.3087	0.5093	0.6677	0.0316	0.3226
-0.119	0.5093	-0.0802	0.1119	0.1178	-0.1283	-0.0242	0.291	-0.1429	0.1457	0.1536	0.0014
-0.1477	-0.1479	0.0348	0.0554	-0.1454	-0.5788	-0.2578	0.2911	-0.5003	-0.1157	-0.1533	-0.2419
	$Market$			$Market$			$Market$			$Market$	
0.848	0.8619	1.1616	1.0619	0.9949	0.9043	0.8902	0.8863	1.1101	0.9451	1.152	0.861
0.8433	0.8181	1.2698	0.9452	0.9421	1.1241	0.8476	0.8445	1.3298	0.9539	0.9799	0.9953
0.9333	0.9916	1.2153	1.0117	0.905	1.2324	0.9599	0.8981	1.2924	1.0479	1.1417	1.0133
	SMB			SMB			SMB			SMB	
0.1628	0.3312	0.5114	0.2134	0.2509	0.4501	0.1479	0.1985	0.5102	0.3453	0.3427	0.2741
0.0853	0.1786	0.1883	-0.0258	0.0813	0.2599	0.1489	0.136	0.2488	0.066	0.0688	0.1675
0.2226	-0.1313	0.0925	-0.0433	0.1668	0.2431	0.0191	-0.0456	0.1937	-0.0051	0.0581	0.2327
	HML			HML			HML			HML	
0.5571	0.4116	1.2011	0.5298	0.5544	1.0988	0.3876	0.533	1.1832	0.8422	0.6679	0.6931
0.329	0.7113	1.0461	0.3849	0.6683	0.8347	0.3845	0.5718	1.2624	0.6156	0.7726	0.5702
0.2532	0.4369	0.7444	0.5215	0.3918	0.5659	0.2986	0.4099	0.6458	0.5311	0.6336	0.2903
	RMW			RMW			RMW			RMW	
0.2636	0.5044	-0.1152	0.3245	0.3072	0.0443	0.2151	0.3996	0.0097	0.1824	0.2146	0.2424
0.4654	0.2799	0.3445	0.5659	0.3087	0.3392	0.4968	0.3541	0.2806	0.3158	0.3874	0.4086
0.6682	0.3245	0.3054	0.4049	0.5108	0.4853	0.648	0.4017	0.3008	0.3701	0.5148	0.5006
	CMA			CMA			CMA			CMA	
-0.1671	0.2464	-0.2331	0.1921	0.211	-0.4778	0.2364	-0.0656	-0.2592	-0.0675	0.3563	-0.2251
0.1717	-0.0224	-0.244	0.2336	-0.095	-0.1052	0.1528	-0.047	-0.2887	0.04	-0.1752	0.1001
0.2744	0.2424	-0.0565	0.1992	0.0511	0.1929	0.3137	0.0655	0.1482	0.1027	0.0445	0.3015

Note: The table shows the coefficients from the Fama-French 5 factor model. The portfolios are constructed from the price to earnings and the quality measures. The quality measures include loss ratio, expense ratio, combined ratio and investment yield. R^2's are also included in the table for each portfolio formulated.

Table 8: T-values of Each Parameter from the Fama-French 5 Factor Model - PE

	PE + Loss			PE + EXP			PE + COMBINED			PE+INVYIELD	
	$t-\alpha$			$t-\alpha$			$t-\alpha$			$t-\alpha$	
2.2633	0.0495	1.0914	-0.4369	1.2438	1.7809	1.5144	1.153	1.3407	2.1982	0.1042	1.3388
-0.5352	1.8974	-0.2778	0.4861	0.4401	-0.5425	-0.0993	1.2173	-0.4662	0.5676	0.6732	0.0057
-0.5309	-0.643	0.1372	0.2353	-0.5962	-2.1317	-0.949	1.3116	-1.8118	-0.5008	-0.6512	-0.8886
	$t-Market$			$t-Market$			$t-Market$			$t-Market$	
10.6241	12.8303	11.2238	13.9664	14.6577	10.1098	11.9398	12.3214	10.8761	11.58	14.1307	13.2967
14.1108	11.3414	16.3638	15.2844	13.0919	17.6944	12.9554	13.1489	16.1392	13.8328	15.987	15.2035
12.4829	16.0465	17.8305	15.9847	13.8058	16.8917	13.15	15.0593	17.4186	16.8794	18.0536	13.8527
	$t-SMB$			$t-SMB$			$t-SMB$			$t-SMB$	
1.5952	3.8558	3.8648	2.1947	2.8909	3.9352	1.5509	2.1582	3.9092	3.3093	3.2878	3.3098
1.1161	1.9362	1.8978	-0.3261	0.8836	3.199	1.7799	1.6565	2.3612	0.7486	0.8779	2.0007
2.3282	-1.6617	1.0612	-0.5354	1.9898	2.6063	0.2046	-0.5977	2.0416	-0.0642	0.7185	2.4879
	$t-HML$			$t-HML$			$t-HML$			$t-HML$	
4.1288	3.6243	6.8653	4.1219	4.8311	7.2672	3.0753	4.3829	6.8575	6.1047	4.8465	6.3318
3.257	5.8333	7.9753	3.6819	5.4943	7.7729	3.4771	5.2663	9.0635	5.2811	7.4564	5.153
2.0031	4.1821	6.4605	4.8744	3.5354	4.5883	2.4199	4.0658	5.149	5.0603	5.9265	2.3473
	$t-RMW$			$t-RMW$			$t-RMW$			$t-RMW$	
1.9471	4.4273	-0.6564	2.5164	2.6688	0.2921	1.7011	3.2751	0.0559	1.318	1.5519	2.2073
4.5914	2.2882	2.6181	5.3957	2.5298	3.1484	4.4772	3.251	2.0081	2.7003	3.7262	3.6805
5.2692	3.0963	2.642	3.7724	4.5945	3.9226	5.2344	3.9717	2.3902	3.5155	4.8	4.0351
	$t-CMA$			$t-CMA$			$t-CMA$			$t-CMA$	
-0.8742	1.5315	-0.9404	1.0549	1.2979	-2.2304	1.3235	-0.3805	-1.0605	-0.3452	1.8247	-1.4516
1.1994	-0.1296	-1.3131	1.5771	-0.5515	-0.6912	0.9754	-0.3055	-1.463	0.242	-1.1936	0.6385
1.5323	1.638	-0.346	1.3142	0.3253	1.1037	1.7939	0.4586	0.8342	0.6907	0.2939	1.721

Note: The table shows the t-statistics from the Fama-French 5 factor model. The portfolios are constructed from the price to earnings and the quality measures. The quality measures include loss ratio, expense ratio, combined ratio and investment yield. R^2's are also included in the table for each portfolio formulated.

Table 9: Fama-French 5 Factor Model vs. Adjusted Fama-French 5 Factor Model - PB and Loss Ratio

	Original FF5			**Adjusted FF5**		
	Low Loss	R^2	High Loss		R^2	
Low PB	34.3031	48.2274	59.9426	42.6545	47.4311	76.3421
	45.9167	49.4935	60.5355	37.0787	44.343	65.9456
High PB	44.9855	52.3194	51.4745	44.9023	47.2381	55.0356
		t-alpha			t-alpha	
	-0.1697	0.4735	0.5324	0.3044	1.0412	1.0819
	0.7874	-0.1619	-0.0179	1.9271	0.6223	0.27
	0.1755	0.6948	-0.2913	1.2624	1.3546	0.5013
		t-MKT			t-MKT	
	9.7921	12.8177	14.7437	11.859	12.3158	14.0192
	13.6306	14.2648	16.2872	12.9149	12.5816	14.0338
	14.1076	15.1085	15.567	14.5344	14.1265	13.2196
		t-SMB			t-SMB	
	2.8801	2.4702	3.8048	-0.6105	-1.9173	-1.2624
	2.312	3.4716	2.4572	-0.957	2.0548	-0.007
	0.6018	-2.8552	-0.7665	-0.4468	-3.9082	-2.0289
		t-HML			t-HML:INS	
	3.2361	5.7878	8.9973	7.7792	6.6042	6.6273
	3.3642	3.651	7.4798	1.171	-3.48	-1.2328
	2.1255	4.6383	3.3367	-4.5168	-4.4602	-5.6647
		t-RMW			t-RMW:INS	
	1.6909	2.1279	0.926	6.4534	1.5857	-11.2587
	5.3385	3.7057	1.2603	3.4783	-2.7214	-10.1942
	4.9005	3.4279	3.494	1.2873	-2.1013	-7.9029
		t-CMA			t-CMA	
	-0.3385	0.8754	-1.7503	2.5868	5.7325	4.771
	0.6914	2.7077	-0.7332	4.6039	7.1437	4.9913
	2.0061	0.5603	0.7155	6.1424	5.5409	4.2225

Note: The table shows R^2 and t-statistics for each factor from the adjusted Fama-French 5 factor model. The new value factor use the sorting of PB ratio. The new quality factor use the sorting of loss ratio. The left part of the table is the original Fama-French 5 factor model. The right part of the table is the new adjusted Fama-French 5 factor model.

Table 10: Fama-French 5 Factor Model vs. Adjusted Fama-French 5 Factor Model - PB and Expense Ratio

	Original FF5			Adjusted FF5		
	Low Exp	R^2	High Exp		R^2	
Low PB	43.8861	52.3092	56.7021	56.2813	55.0319	69.3715
	50.3915	46.5873	58.7411	45.2813	38.9401	52.4895
High PB	56.9851	37.9385	54.6369	50.2086	37.4788	54.5791
		t-alpha			t-alpha	
	-0.1188	0.7547	0.6844	0.0517	0.9925	1.575
	0.5041	-0.2923	-0.2651	1.2548	0.5594	0.677
	0.5472	0.6496	-1.0061	1.4353	1.6512	0.0687
		t-MKT			t-MKT	
	12.0475	13.1727	13.5113	13.909	13.7471	14.8883
	15.5312	13.5412	16.1566	15.3975	12.9585	15.0689
	16.8959	11.9717	16.3084	17.0178	12.3245	16.5559
		t-SMB			t-SMB	
	3.1513	1.8045	4.8258	0.0795	-2.7478	-1.4822
	-0.1601	3.7417	3.1771	-2.0267	1.5861	-0.9073
	-1.3004	0.0529	1.2419	-2.7499	-1.1744	-1.3722
		t-HML			t-HML:INS	
	4.3862	7.41	8.0259	11.1658	8.5602	8.3588
	2.8695	3.1743	6.7404	0.8246	-0.0195	-0.6441
	4.7494	2.0332	3.954	-2.6609	-5.1857	-4.9432
		t-RMW			t-RMW:INS	
	2.1162	0.7409	0.8081	7.7426	0.6679	-6.8146
	4.2668	4.2975	2.9209	3.1638	1.5853	-5.1552
	5.3598	3.8478	3.3098	2.926	-2.3216	-6.2215
		t-CMA			t-CMA	
	1.0806	-0.4018	-1.9762	4.592	5.0773	4.2471
	2.5622	0.3802	0.2776	6.0484	3.6297	6.4513
	0.4731	0.2527	1.1563	5.6368	3.4551	6.2866

Note: The table shows R^2 and t-statistics for each factor from the adjusted Fama-French 5 factor model. The new value factor use the sorting of PB ratio. The new quality factor use the sorting of expense ratio. The left part of the table is the original Fama-French 5 factor model. The right part of the table is the new adjusted Fama-French 5 factor model.

Table 11: Fama-French 5 Factor Model vs. Adjusted Fama-French 5 Factor Model - PB and Combined Ratio

	Original FF5			**Adjusted FF5**		
	Low Comb	R^2	High Comb		R^2	
Low PB	26.4946	49.7122	61.2633	41.2209	45.7197	78.1063
	44.9688	51.3173	62.6229	34.3553	45.2709	65.197
High PB	49.8252	45.2059	55.8912	48.0862	40.8151	55.719
		t-alpha			t-alpha	
	-0.534	1.9854	0.5387	-0.4339	2.3245	1.4134
	-0.2305	0.9987	-0.7634	0.7837	1.8542	-0.176
	0.5521	0.9899	-0.9466	1.695	1.8536	-0.1213
		t-MKT			t-MKT	
	8.3761	12.4507	15.4688	11.2205	11.9982	15.0166
	13.0155	15.5591	17.1164	12.1122	13.8134	14.1115
	15.4154	13.3687	16.5828	15.2585	11.8057	13.9263
		t-SMB			t-SMB	
	2.668	1.6815	4.3624	0.255	-2.6939	-1.1179
	1.9507	2.1283	3.4183	-0.9563	0.0763	0.5394
	-0.3592	-0.857	-0.2499	-1.5737	-2.1413	-2.0828
		t-HML			t-HML:INS	
	1.4405	7.3854	8.5844	8.4534	6.3976	5.8445
	4.0479	2.9026	7.6448	0.6573	-1.3684	-2.7304
	2.6289	3.658	4.4255	-4.6594	-4.6232	-4.7674
		t-RMW			t-RMW:INS	
	0.9213	1.5682	1.156	7.5539	1.6915	-11.0381
	4.9208	3.9398	2.0168	2.5111	-0.9395	-9.7793
	5.2782	3.8975	3.2723	0.5189	-2.9763	-6.8757
		t-CMA			t-CMA	
	1.7719	-0.8704	-1.1973	3.6921	4.6127	5.8576
	1.0499	1.713	-0.0716	5.39	5.1763	6.5321
	1.8859	-0.072	0.1103	6.343	3.9925	4.4739

Note: The table shows R^2 and t-statistics for each factor from the adjusted Fama-French 5 factor model. The new value factor use the sorting of PB ratio. The new quality factor use the sorting of combined ratio. The left part of the table is the original Fama-French 5 factor model. The right part of the table is the new adjusted Fama-French 5 factor model.

Table 12: Fama-French 5 Factor Model vs. Adjusted Fama-French 5 Factor Model - PB and Investment Yield

	Original FF5			**Adjusted FF5**		
	Low Invy	R^2	High Invy		R^2	
Low PB	43.3777	54.8921	56.5524	65.6319	62.3941	57.9022
	54.4154	59.427	48.7595	46.5439	46.8371	47.5717
High PB	51.4281	52.1512	52.5443	51.1253	45.0266	45.7846
		t-alpha			t-alpha	
	1.2136	0.2679	-0.0061	1.4868	0.8935	0.5299
	-0.672	-0.0659	1.3364	0.3791	0.7597	2.0831
	0.5205	-0.0382	-0.9987	1.473	0.9459	0.0559
		t-MKT			t-MKT	
	9.819	14.5636	14.4109	11.3976	15.1386	15.417
	16.1302	16.8168	13.7263	14.3899	15.3923	14.6496
	15.637	15.6653	15.8512	16.5561	15.2622	15.6448
		t-SMB			t-SMB	
	1.9447	2.8145	3.5353	-1.6683	-2.8048	-1.7698
	0.9089	3.2954	3.4327	-2.0484	0.1492	0.2713
	-0.2237	-1.0569	-0.1553	-0.9175	-2.8743	-2.627
		t-HML			t-HML:INS	
	7.2838	6.6672	7.5934	13.2871	11.8405	7.4798
	4.456	6.3163	4.3039	1.1102	-0.2656	0.849
	3.404	3.661	3.6409	-6.2117	-3.429	-2.561
		t-RMW			t-RMW:INS	
	-0.6064	1.8859	2.1334	11.2085	0.5494	-6.2553
	4.624	4.1778	3.148	3.6466	-0.475	-6.0641
	4.381	4.6914	4.786	2.6915	0.0851	-2.9538
		t-CMA			t-CMA	
	-0.4926	0.4595	-2.2119	4.3729	5.7435	3.9425
	0.5047	0.6518	1.3333	4.2226	6.2637	6.5289
	1.3989	0.5424	0.6056	5.9875	4.7315	5.04

Note: The table shows R^2 and t-statistics for each factor from the adjusted Fama-French 5 factor model. The new value factor use the sorting of PB ratio. The new quality factor use the sorting of investment yield. The left part of the table is the original Fama-French 5 factor model. The right part of the table is the new adjusted Fama-French 5 factor model.

Table 13: Fama-French 5 Factor Model vs. Adjusted Fama-French 5 Factor Model - PE and Loss Ratio

	Original FF5			**Adjusted FF5**		
	Low Loss	R^2	High Loss		R^2	
Low PE	37.5606	44.842	48.9892	41.5958	39.2666	76.8766
	46.731	43.1465	60.4991	40.6092	33.7385	64.4757
High PE	39.9689	53.8066	61.7429	37.3469	55.0618	65.4701
		t-alpha			t-alpha	
	2.2633	0.0495	1.0914	2.1453	0.5657	0.3232
	-0.5352	1.8974	-0.2778	0.3721	2.1369	0.7797
	-0.5309	-0.643	0.1372	1.0184	0.7884	1.3548
		t-MKT			t-MKT	
	10.6241	12.8303	11.2238	13.2773	11.9765	12.8776
	14.1108	11.3414	16.3638	13.9975	9.8129	12.7428
	12.4829	16.0465	17.8305	12.1273	14.416	14.7352
		t-SMB			t-SMB	
	1.5952	3.8558	3.8648	-1.4505	-0.1032	0.3646
	1.1161	1.9362	1.8978	-1.679	-0.7742	-0.802
	2.3282	-1.6617	1.0612	0.6277	-2.5767	-0.9834
		t-HML			t-HML:INS	
	4.1288	3.6243	6.8653	6.4244	4.6162	10.6614
	3.257	5.8333	7.9753	1.0357	1.2696	-4.2148
	2.0031	4.1821	6.4605	-3.3267	-7.1248	-5.322
		t-RMW			t-RMW:INS	
	1.9471	4.4273	-0.6564	5.2329	1.3105	-15.236
	4.5914	2.2882	2.6181	3.9239	-2.1555	-12.0578
	5.2692	3.0963	2.642	3.5771	-3.4195	-10.279
		t-CMA			t-CMA	
	-0.8742	1.5315	-0.9404	3.5458	5.6379	4.9773
	1.1994	-0.1296	-1.3131	5.3479	4.7004	4.5559
	1.5323	1.638	-0.346	4.9351	6.1237	4.7155

Note: The table shows R^2 and t-statistics for each factor from the adjusted Fama-French 5 factor model. The new value factor use the sorting of PE ratio. The new quality factor use the sorting of loss ratio. The left part of the table is the original Fama-French 5 factor model. The right part of the table is the new adjusted Fama-French 5 factor model.

Table 14: Fama-French 5 Factor Model vs. Adjusted Fama-French 5 Factor Model - PE and Expense Ratio

	Original FF5			**Adjusted FF5**		
	Low Exp	R^2	High Exp		R^2	
Low PE	48.6649	52.1367	45.4612	50.9385	54.7567	60.6965
	51.0176	47.5196	63.4622	41.259	39.5527	57.9968
High PE	54.4416	46.6436	57.2668	51.5604	41.138	56.5496
		t-alpha			t-alpha	
	-0.4369	1.2438	1.7809	-0.8375	0.997	1.8661
	0.4861	0.4401	-0.5425	1.4689	0.7195	0.8662
	0.2353	-0.5962	-2.1317	1.3984	0.9387	-0.3169
		t-MKT			t-MKT	
	13.9664	14.6577	10.1098	16.3566	16.5595	12.3042
	15.2844	13.0919	17.6944	14.2717	12.9412	16.1985
	15.9847	13.8058	16.8917	16.507	12.8071	15.9513
		t-SMB			t-SMB	
	2.1947	2.8909	3.9352	-0.088	-1.0263	-1.7727
	-0.3261	0.8836	3.199	-2.6398	-2.2914	-0.9225
	-0.5354	1.9898	2.6063	-1.2279	0.244	-0.0798
		t-HML			t-HML:INS	
	4.1219	4.8311	7.2672	6.4119	8.1789	8.0484
	3.6819	5.4943	7.7729	-0.1814	2.6087	-3.2151
	4.8744	3.5354	4.5883	-4.9223	-4.6024	-6.0548
		t-RMW			t-RMW:INS	
	2.5164	2.6688	0.2921	4.9457	1.5152	-9.1495
	5.3957	2.5298	3.1484	2.6971	-0.9225	-7.1715
	3.7724	4.5945	3.9226	2.5384	-0.4827	-5.585
		t-CMA			t-CMA	
	1.0549	1.2979	-2.2304	5.5317	6.5185	4.1988
	1.5771	-0.5515	-0.6912	5.6073	4.2514	6.2075
	1.3142	0.3253	1.1037	6.6428	4.1157	6.2119

Note: The table shows R^2 and t-statistics for each factor from the adjusted Fama-French 5 factor model. The new value factor use the sorting of PE ratio. The new quality factor use the sorting of expense ratio. The left part of the table is the original Fama-French 5 factor model. The right part of the table is the new adjusted Fama-French 5 factor model.

Table 15: Fama-French 5 Factor Model vs. Adjusted Fama-French 5 Factor Model - PE and Combined Ratio

	Original FF5			**Adjusted FF5**		
	Low Comb	R^2	High Comb		R^2	
Low PE	40.3591	43.5261	47.1067	44.151	39.3277	73.3247
	43.5724	47.3713	61.7988	36.0172	37.1982	66.1784
High PE	42.4693	50.8024	59.7378	40.7803	46.0512	64.2574
		t-alpha			t-alpha	
	1.5144	1.153	1.3407	1.3026	1.3112	1.219
	-0.0993	1.2173	-0.4662	0.696	1.8887	0.5034
	-0.949	1.3116	-1.8118	0.5198	2.6909	-0.5346
		t-MKT			t-MKT	
	11.9398	12.3214	10.8761	14.2642	12.2783	11.3037
	12.9554	13.1489	16.1392	12.6053	11.0072	12.4959
	13.15	15.0593	17.4186	13.1469	12.6098	14.8288
		t-SMB			t-SMB	
	1.5509	2.1582	3.9092	-0.771	-1.3895	-0.6522
	1.7799	1.6565	2.3612	-0.87	-1.0114	-1.3207
	0.2046	-0.5977	2.0416	-1.3832	-2.3789	0.588
		t-HML			t-HML:INS	
	3.0753	4.3829	6.8575	5.6773	4.9609	9.2319
	3.4771	5.2663	9.0635	1.1389	-0.378	-3.0163
	2.4199	4.0658	5.149	-3.3649	-4.6103	-6.6788
		t-RMW			t-RMW:INS	
	1.7011	3.2751	0.0559	4.4988	1.7276	-14.0201
	4.4772	3.251	2.0081	3.3416	-1.7957	-13.0501
	5.2344	3.9717	2.3902	4.1357	-2.3595	-8.6454
		t-CMA			t-CMA	
	1.3235	-0.3805	-1.0605	5.3374	3.8306	5.0797
	0.9754	-0.3055	-1.463	5.0444	4.1968	5.608
	1.7939	0.4586	0.8342	5.6712	4.4095	5.6562

Note: The table shows R^2 and t-statistics for each factor from the adjusted Fama-French 5 factor model. The new value factor use the sorting of PE ratio. The new quality factor use the sorting of combined ratio. The left part of the table is the original Fama-French 5 factor model. The right part of the table is the new adjusted Fama-French 5 factor model.

Table 16: Fama-French 5 Factor Model vs. Adjusted Fama-French 5 Factor Model - PE and Investment Yield

		Original FF5			**Adjusted FF5**	
	Low Invy	R^2	High Invy		R^2	
Low PE	46.0484	51.8329	51.2845	55.5955	58.0994	52.4021
	49.2417	58.4382	53.2135	44.8863	43.7386	46.3808
High PE	57.1328	60.9874	45.3527	56.3222	52.0955	46.2288
		t-alpha			t-alpha	
	2.1982	0.1042	1.3388	1.79	-0.468	1.2665
	0.5676	0.6732	0.0057	0.9935	1.1972	0.8858
	-0.5008	-0.6512	-0.8886	0.8705	0.8528	0.3815
		t-MKT			t-MKT	
	11.58	14.1307	13.2967	13.9096	17.0679	15.7611
	13.8328	15.987	15.2035	13.8046	14.7375	15.5548
	16.8794	18.0536	13.8527	17.2895	16.997	14.782
		t-SMB			t-SMB	
	3.3093	3.2878	3.3098	-0.0155	-0.5932	-0.9955
	0.7486	0.8779	2.0007	-1.3679	-2.2128	-0.8994
	-0.0642	0.7185	2.4879	-0.8485	-1.3384	0.4068
		t-HML			t-HML:INS	
	6.1047	4.8465	6.3318	9.6971	9.2573	5.8301
	5.2811	7.4564	5.153	1.3439	0.9388	-1.0588
	5.0603	5.9265	2.3473	-5.9902	-4.7056	-3.3649
		t-RMW			t-RMW:INS	
	1.318	1.5519	2.2073	7.2637	0.3599	-5.3478
	2.7003	3.7262	3.6805	5.1574	1.3411	-4.322
	3.5155	4.8	4.0351	3.3087	-0.2995	-5.7822
		t-CMA			t-CMA	
	-0.3452	1.8247	-1.4516	4.7687	7.322	4.6966
	0.242	-1.1936	0.6385	4.6158	4.7066	6.1412
	0.6907	0.2939	1.721	5.6538	5.8925	5.6889

Note: The table shows R^2 and t-statistics for each factor from the adjusted Fama-French 5 factor model. The new value factor use the sorting of PE ratio. The new quality factor use the sorting of investment yield. The left part of the table is the original Fama-French 5 factor model. The right part of the table is the new adjusted Fama-French 5 factor model.