EasyChair Preprint

№ 1910

Does the Factors Model Perform Well in Emerging Market? - the Empirical Evidence of China Stock Market.

Yichi Zhang, Selma Izadi and Mohammad Kabir Hassan

November 9, 2019

DOSE THE FACTOR MODEL PERFORM WELL IN EMERGING MARKET?-THE EMPIRICAL EVIDENCE OF CHINA STOCK MARKET.

YiChi Zhang, University of New Orleans, 2000 Lakeshore Drive New Orleans, LA 70148, (504)826-0642, yzhang30@uno.edu

Selma Izadi, Loyola University New Orleans College of Business, Box 15, 6363 St. Charles Avenue, New Orleans, LA 70118, (504) 864-7961, sizadi@loyno.edu

Mohammad Kabir Hassan, University of New Orleans, 2000 Lakeshore Drive New Orleans, LA 70148, (504)280-6163, mhassan@uno.edu

ABSTRACT

The most famous asset pricing models, 3factor (Fama and French, 1992, 1993 and 1996) and 5 factor (Fama and French, 2015) model, in the past few decades were applied in many countries. The U.S. (developed financial markets) country-specific additional 2 factors in the 5-factor model, RMW and CMA or profitability premium and investment premium, empirically cannot further capture the return variation of classic 3 factors/chrematistics in China (developing financial markets) stock market. Therefore, the classic 3-factor has better performance than the 5-factor model in China. We do not presume that firms in different countries share same features. Following the (Liu, Stambaugh and Yuan, 2019), we replace the book-to-market ratio to earning-to-price ratio (EP ratio). By using Shanghai and Shenzhen exchange stocks, we find out the redundancy of HML only in the 5-factor model. In the Fama MacBeth regression, the SMB and HML are significant factors in three factor model for explaining the China return variation.

INTRODUCTION

The localized factors or characteristics model must be concerned and developed by future researchers. Based on U.S. data, Fama and French(1996, 2015) created common factors to explain expected return anomalies. However, instead of creating another country specific “factors or characteristics zoo” and based on framework of FF3/FF5 factors and (Liu, Stambaugh and Yuan, 2019), hereafter LSY(2019), we mainly focus on the empirical performance of factor model in explaining expected return anomalies. The emerging China stock market may not the case of developed U.S. stock market, investors are separated and fledgling comparing with the investors in the developed financial market. Many papers found out that the lottery and speculative players in investment behavior. According to LSY(2019) and Lee, Qu and Shen(2017), hereafter LQS(2017), intended-IPO firms face extremely long inspectional process and high cost, therefore, these companies brought “nearly bankruptcy or bad performance public firm” – the common part of these firms is small size and low EP ratio – for completing the indirect Initial Public Offering. We can see the indirect-IPO throughout the past 20 years in China stock market. Until the end of 2013, China Securities Regulatory Commission, (CSRC), implemented *IPO Standards in the Audit of Reverse Mergers* for regulating and managing requirements of indirect-IPO firms. At September 2019, CSRC revised the previous acts and detailed the processes of the inspection.

What are the determinants of factors in explaining the stock return? This question is an enduring topic and a prominent issue in the study of asset pricing not only in developed country but also in developing country wild. In the recent decade, researchers gradually focus on performance of factor model in emerging market. the long-term excess returns of certain investment strategies motivate scholars and

researchers to continuously improve and modify the theoretical system of pricing model, increasing in the pricing efficiency of the capital market and trading strategy. The CAMP assumption of the singleton factor cannot satisfy the real stock market. There are lot of frictional trading transaction, such as tax and other cost, thus investors impossibly hold entire market portfolio. The CAPM may include additional factors for explaining the real market. APT extends the CAPM to multiple factors. Arbitrage pricing theory indicate that the behavior of arbitrage is a determining factor in the formation of modern efficient markets (market equilibrium prices). If the market does not stay in equilibrium, it will be risk-free arbitrage opportunities in the market. According to the no-arbitrage principle, a number of factors are used to explain the risky assets' returns, leading an approximately linear relationship between the risky assets' equilibrium returns and multiple factors. However, The CAPM model predicts that all securities' yields are relate to the unique common factor which is the market portfolios. Based on CAPM and U.S. data, Fama and French(1996) empirically presented that SMB and HML can further explain stock return.

Based on the three-factor model, Fama and French (2015) provided the five-factor model in including the profitability factor RMW and the investment factor CMA, they also confirmed the validity of the five-factor model by using more than 50 years of market data in the United States. However, some Chinese researchers' empirical results show that the additive profitability factors RMW and the investment factor CMA, the value factor HML becomes a redundant variable. 5 factor-model is a new way to understand the market, thus a few analyzing articles focus on application of China's 5 factor model. This situation has attracted our attention and discussion. In this article, the empirical results support that 3 factors model(market premium, market capitalization and earning to price ratio) have strong significant value in Fama MacBeth regression, however, by using 5 factors, we didn't find out the factors' significant, thus Fama and French 3 factor model could be completely fitted in Chinese market but 5 factors

LITERATURE REVIEW

Unlike the US stock market, China's stock market was established less than 30 years ago, and the market is still developing on many aspects, such as, law, speculative investors, institutional investment and banking system, etc. In China, some researchers approved the size effect and value (Book to Price ratio) effect by using certain time period, some support Earning to Price ratio. We mainly apply time-period is from 01/2003 to 12/2018. In the early time, stock market has a serious speculation, information disclosure Opaque, information distortion and other market characteristics. The three-factor model is based on US capital market. Unfortunately, we find a few of relative papers focusing on the 3 and 5 factors model by using China data.

Cooper et al. (2008) found that the company's total asset growth rate predicts US stock returns. Novy-Marx (2013) believes that ROA's ability to interpret corporate returns on cross-sectional data is approximately the same as book value to market value. In addition to profitability, investment levels are also an important factor affecting the return on assets. Arharoni et al. (2013) believe that high investment level and high investment return rate increase the company's future total assets, but high investment levels will reduce the current total assets, so the company's investment decisions affect the value of the company. Titman et al. (2004) found that investment has a significant negative impact on the company's stock returns, especially for companies with ample cash flow and low debt ratios. (Cooper and Priestley, 2011) believe that the difference in corporate portfolio returns with high investment levels and low investment levels stems from systemic risks. Systemic risk is low when the investment level is high, and it has a higher return on portfolio investment. The current research on the company's profitability and investment level became the main direction of the asset pricing model, but research on emerging markets combined with profitability factors and investment factors is still rare, especially in Chinese market. Therefore, this article is based on the Fama and French three and five factor pricing model to study whether the profitability and investment factors in the Chinese market can explain quarterly excess rate of return. If the importance of the factor pricing model varies from market to market, this paper complements the research in this area.

DATA AND METHODOLOGY

Based on China CSMAR database, one of the China major commercial data provider. Specifically, we need the monthly stock return, considering the monthly cash dividend reinvestment; risk-free rate is the three-month fixed-time deposited rate and the quarterly financial reports. The full sample time period across January 2003 to December 2018. Because the classic methodology required value weighted stock return (VWRET) to construct the portfolios, we then compute them on monthly frequency.

The regression methodology called OLS time-series regression or Fama and French regression. These cross-sectional loadings, b_i , s_i , h_i , r_i and c_i, were estimated from the monthly value-weighted return on mimicking size and other explanatory/independent variables. (a)Stocks within 15 days in the previous month or those of them have less than 120 days in the last year were dropped for decreasing the targets of potential indirect-IPO, LSY(2019) indicated that the rank of bottom 30% market-cap should be delate for step-aside the potential indirect-IPO. (b)The bad-performance firms were delated because of the same reason, such as the prefix contains *S and PT. (c)Financial firms were excluded. (d)we smooth the 1% of relevant variables on each tail.(d) we use, Shanghai and Shenzhen stock exchange,

two major exchanges data to form the story, such as, the first two digits “00” “60” and “30”. (e) the start date is January 2003 and the end date is December 2018, thus, 192 months is the maximum period. The total number of companies in December 2018 is around 3800, after meeting all the requirements, our sample contains around 2400 firms and 290,000 observations.

Regression model:

$$R_{\mathrm{it}} - R_{\mathrm{Ft}} = a_i + b_i(R_{\mathrm{Mt}} - R_{\mathrm{Ft}}) + s_i\mathrm{SMB}_t + h_i\mathrm{HML}_t + e_{\mathrm{it}}\text{--(1)}$$

$$R_{\mathrm{it}} - R_{\mathrm{Ft}} = a_i + b_i(R_{\mathrm{Mt}} - R_{\mathrm{Ft}}) + s_i\mathrm{SMB}_t + h_i\mathrm{HML}_t + r_i\mathrm{RMW}_t + c_i\mathrm{CMA}_t + e_{\mathrm{it}}\text{--(2)}$$

R_i, the return of the portfolio “i”, R_{Ft} is the risk-free rate, therefore, the LHS is the excess portfolio return sorted by size and ratio . R_{Mt} is the monthly value weighted market return; SMB (small mines big) is the return-difference between the low market-cap portfolio and the high market-cap portfolio (market-value equals to the total share times the monthly end stock price) on time t, HML (high mines low) is the return-difference between the low The reciprocal of price-to-earnings ratio (P/E ratio) portfolio and the high reciprocal of price-to-earnings ratio (P/E ratio) portfolio on time t, e_{it} is the residual of portfolio “i” on month t. Every end of year, we cut the EP on time t into 3 groups by quantile 30^{th} and 70^{th} by using the ranked EP t-1. Furthermore, every June, we break the ranked size t into 2 groups by median, based on the separation of ratio(EP) and the separation of size(market-cap), we sort the ratio and size in year t, therefore, there are six portfolios in place. Monthly Value-weighted was calculated for constructing S/L, S/N, SH, B/L, B/N and B/H and these components formed SMB and HML. For ranking the excess portfolio return, we use the same method but cut the EP and size into 5 groups respectively, thus, 25 Monthly Value-weighted portfolios formed the whole picture. On the second equation, RMW_t is the difference between the returns on diversified portfolios of stocks with robust and weak profitability, every end of year, we use previous .CMA_t is the difference between the returns on diversified portfolios of the stocks of low and high investment firms, which are conservative and aggressive firm.

5 factor construction		
Sort	Breakpoint	Construction
Size and E/P, or Size and OP, or	Size: median E/P: 30^{th} and 70^{th}	$SMB_{E/P}$ = (SL+SN+SH)/3 – (BL+BN+BH)/3 SMBop = (SR+SN+SW)/3 – (BR+BN+BW)/3

Size and Inv	OP: 30^{th} and 70^{th} Inv: 30^{th} and 70^{th} On percentiles	SMB_{Inv} = (SC+SN+SA)/3 – (BC+BN+BA)/3 thus, SMB = ($SMB_{E/P}$ + SMBop + SMB_{Inv})/3 HML=(SH+BH)/2 – (SL+BL)/2 RMW=(SR +BR)/2 – (SW+BW)/2 CMA=(SC+BC)/2 – (SA+BA)/2
3 factor construction		
Sort	Breakpoint	Construction
Size and E/P	Size: median E/P: 30^{th} and 70^{th}	SMB=(SL+SN+SH)/3 – (BL+BN+BH)/2 HML=(SH+BH)/2 – (SL+BL)/2

In summary, if the model performs well, the expected return can fully captured by the b_i , s_i , h_i , r_i and c_i. Thus, the R-squares must be very high, and the pricing error must be very low while all the intercepts must be statistically insignificant. However, the level of market efficiency and market self-regulated can be a very important precondition for explaining anomalies. The grafting model is questionable, the unique version of China stock market is necessary to develop.

In fact, regulations are very different between USA and China, factor construction do impact on the final result. Based on the China list company, some researchers find the B/M ratio factor is redundant, also, other researchers in China find the book-to-market ratios are not explanatory, thus these researchers replace the (B/M) book-to-market ratios to (P/B) price-to-book ratios in the 3-factor studying. One of the major school use the reciprocal of (P/B) price-to-book ratios as a substitution of (B/M) book-to-market ratios. However, Liu, Stambaugh and Yuan(2019) supportive proved the performance of earning to price ratio(EP) by using China stock market data.

There are mainly three types of separating ways for constructing the 5 factors model. 2X3, 2X2 and 2X2X2X2. In this paper, 2X3 separation is the only methodology.

THE EMPIRICAL RESULTS

We sort the stocks into 25 portfolios on size, value and other factors. Low ratios and high ratio represent the incremental level of Earning to Pricing. The small and big size represent the incremental level of firm's market capitalization(total share times the month end price). We run the time-series regression for estimating the loading of each portfolio, such as, the intercept, α, coefficients of market premium, Coff. RP, size premium, Coff. SMB and value premium, Coff. HML. t(α), t(RP), t(SMB) and t(HML) are the corresponding t-statistics. Residuals are the time-series regression of each 25 portfolio.

Table 1

Fama - French three factor regression - average portfolio excess return												
Size and EP ratio - The performance of Fama and French 3 factor model from 2003 - 2018												
$R_{\mathrm{it}} - R_{\mathrm{Ft}} = a_i + Coff.RP_i(R_{\mathrm{Mt}} - R_{\mathrm{Ft}}) + Coff.SMB_i\mathrm{SMB}_t + Coff.HML_i\mathrm{HML}_t + e_{\mathrm{it}}$												
α							t(α)					
	Low Ratio	2	3	4	High Ratio			Low Ratio	2	3	4	High Ratio
Small	-0.0342	-0.0239	-0.0116	-0.0098	-0.0125		Small	-2.79	-1.90	-0.85	-0.70	-0.91
2	-0.0204	-0.0177	-0.0035	-0.0049	-0.0065		2	-1.83	-1.54	-0.30	-0.51	-0.82
3	-0.0088	-0.0025	0.0110	0.0115	0.0053		3	-1.09	-0.29	1.33	1.29	0.86
4	0.0030	0.0019	0.0114	0.0074	0.0116		4	0.31	0.26	1.33	0.85	1.92
Big Size	-0.0109	-0.0173	-0.0107	-0.0100	0.0046		Big	-1.72	-3.63	-1.64	-2.08	0.75
Coff. RP							t(RP)					
	Low Ratio	2	3	4	High Ratio			Low Ratio	2	3	4	High Ratio
Small	0.768	0.812	0.874	0.882	0.874		Small Size	15.21	16.10	17.38	17.46	16.88
2	0.850	0.864	0.937	0.909	0.917		2	20.05	18.29	21.00	23.33	28.23
3	0.921	0.944	0.993	1.015	0.979		3	28.63	25.06	31.50	29.52	40.60
4	0.988	0.971	1.009	0.989	1.011		4	26.32	34.77	28.41	31.07	45.70
Big	0.926	0.886	0.922	0.918	0.993		Big	26.34	29.92	30.89	44.38	34.52
Coff. SMB							t(SMB)					
	Low Ratio	2	3	4	High Ratio			Low Ratio	2	3	4	High Ratio
Small	0.498	0.508	0.487	0.473	0.344		Small	8.88	8.27	7.37	7.52	5.82
2	0.488	0.580	0.519	0.434	0.349		2	7.91	9.64	8.25	7.03	9.75
3	0.300	0.338	0.307	0.311	0.183		3	3.35	5.85	5.26	6.76	3.32
4	-0.065	-0.013	0.021	-0.029	-0.047		4	-1.35	-0.40	0.52	-0.60	-2.05
Big	-0.147	-0.095	-0.032	-0.068	-0.076		Big	-4.32	-2.78	-0.92	-2.56	-1.67
Coff. HML							t(HML)					
	Low Ratio	2	3	4	High Ratio			Low Ratio	2	3	4	High Ratio
Small	-0.396	-0.329	-0.168	-0.005	0.144		Small	-8.69	-5.57	-4.29	-0.11	5.44
2	-0.400	-0.355	-0.119	0.079	0.155		2	-6.88	-5.20	-5.49	4.43	5.73
3	-0.335	-0.277	-0.082	0.047	0.119		3	-8.67	-6.51	-4.81	2.88	6.00
4	-0.289	-0.224	-0.058	0.016	0.096		4	-7.69	-9.05	-2.98	0.83	4.75
Big	-0.136	-0.132	-0.044	0.005	0.073		Big	-2.79	-2.25	-2.69	0.31	3.41
R square (Time-series regression)							Residual 【stander deviation】					
	Low	2	3	4	High			Low	2	3	4	High

	Ratio				Ratio			Ratio				Ratio
Small Size	84%	85%	85%	83%	84%		Small Size	4.96%	5.07%	4.98%	5.38%	5.25%
2	85%	86%	87%	86%	90%		2	5.32%	4.97%	4.61%	4.64%	4.05%
3	87%	86%	86%	88%	90%		3	4.79%	4.68%	4.37%	4.05%	3.73%
4	86%	86%	86%	83%	91%		4	5.09%	4.61%	4.62%	4.81%	3.50%
Big Size	80%	88%	88%	91%	92%		Big Size	5.46%	4.00%	3.84%	3.28%	3.24%

In June of year t, we firstly separate list firms into 2 groups (small or big, S or B) by median market capitalization(total shares outstanding times the month end stock price) and reform the rank in June of year t+1. Based on EP , the earning to price ratio, in the year of t -1, we then separate list firms into 3 segments by 30^{th} and 70^{th} quintiles, we have the low ratio(L), middle ratio (N)and high ratio groups(H). Thus, we intersectionally have 6 grouped portfolios, such as, SL, SN, SH, BL,BN and BH, to construct SMB and HML. In the whole paper, monthly value weighted returns were calculated in each portfolio. The market risk premium was the difference between value weighted market return and three month fixed deposited rate. We use the same methodology to construct 25 portfolios by size(5 groups) and EP(5 groups).

Table 2

Fama - French three factor regression average portfolio excess return												
Size and PE ratio / 2X3model / The performance of Fama and French 5 factor model from 2003 - 2018												
$R_{\mathrm{it}} - R_{\mathrm{Ft}} = a_i + Coff.RP_i(R_{\mathrm{Mt}} - R_{\mathrm{Ft}}) + Coff.SMB_i\mathrm{SMB}_t + Coff.HML_i\mathrm{HML}_t + Coff.RMW_i\mathrm{RMW}_t + Coff.CMA_i\mathrm{CMA}_t + e_{\mathrm{it}}$												
α							t(α)					
	Low Ratio	2	3	4	High Ratio			Low Ratio	2	3	4	High Ratio
Small	0.0056	0.0075	0.0082	0.0059	0.0078		Small	1.13	1.47	1.44	1.16	1.88
2	0.0068	0.0087	0.0055	0.0094	0.0084		2	1.31	1.44	1.22	2.18	2.55
3	0.0101	0.0096	0.0124	0.0084	0.0101		3	1.95	2.13	3.23	2.28	3.34
4	0.0099	0.0099	0.0099	0.0093	0.0103		4	2.28	2.17	2.46	2.16	4.26
Big Size	0.0021	0.0007	-0.0017	-0.0013	0.0029		Big	0.87	0.31	-0.46	-0.45	1.64
Coff. HML							t(H)					
	Low Ratio	2	3	4	High Ratio			Low Ratio	2	3	4	High Ratio
Small	-0.179	-0.215	-0.025	0.060	0.200		Small Size	-6.06	-5.21	-1.32	1.08	4.61
2	-0.174	-0.187	0.010	0.094	0.138		2	-3.91	-4.26	0.21	3.29	5.33
3	-0.163	-0.133	-0.041	0.017	0.060		3	-4.07	-3.51	-1.79	0.85	2.12
4	-0.095	-0.146	-0.046	0.001	0.063		4	-1.61	-7.72	-3.70	0.04	1.85
Big	-0.085	-0.162	-0.059	0.020	0.026		Big	-1.31	-3.54	-2.68	1.60	1.09
Coff. RMW							t(R)					
	Low	2	3	4	High			Low	2	3	4	High Ratio

	Ratio				Ratio			Ratio				
Small	-0.040	-0.050	-0.092	0.001	-0.025		Small	-2.01	-3.68	-4.66	0.05	-2.05
2	-0.079	-0.029	-0.090	-0.059	-0.007		2	-3.56	-2.23	-4.07	-5.65	-1.69
3	-0.080	-0.035	-0.051	-0.058	-0.018		3	-5.83	-3.54	-3.06	-3.68	-1.48
4	-0.042	-0.051	-0.086	-0.065	-0.011		4	-3.82	-3.02	-6.96	-2.95	-1.37
Big	-0.033	-0.054	-0.046	-0.025	0.052		Big	-0.82	-4.10	-4.12	-2.91	4.21
Coff. CMA							t(c)					
	Low Ratio	2	3	4	High Ratio			Low Ratio	2	3	4	High Ratio
Small	0.038	-0.016	-0.172	-0.206	-0.070		Small	1.18	-0.71	-5.27	-3.92	-1.72
2	0.016	-0.051	-0.122	-0.112	-0.094		2	0.25	-3.01	-4.79	-2.93	-5.37
3	0.108	-0.023	-0.061	-0.076	-0.024		3	2.26	-1.80	-3.25	-4.92	-1.66
4	-0.019	-0.041	-0.084	-0.123	-0.057		4	-0.52	-1.64	-2.74	-3.23	-2.52
Big	0.088	-0.018	-0.126	-0.078	0.083		Big	3.91	-0.80	-4.30	-2.86	4.73
Coff. SMB							t(s)					
	Low Ratio	2	3	4	High Ratio			Low Ratio	2	3	4	High Ratio
Small	0.728	0.714	0.671	0.743	0.505		Small	8.92	8.09	6.69	8.79	6.61
2	0.663	0.752	0.599	0.535	0.448		2	8.00	8.03	8.00	6.10	11.48
3	0.502	0.464	0.394	0.337	0.245		3	4.35	6.22	5.19	6.63	3.67
4	0.097	0.119	0.095	0.034	-0.022		4	1.31	3.65	3.25	0.73	-1.10
Big	-0.182	-0.164	-0.241	-0.308	-0.207		Big	-3.20	-5.38	-6.15	-5.53	-5.50
Coff. RP							T(RP)					
	Low Ratio	2	3	4	High Ratio			Low Ratio	2	3	4	High Ratio
Small Size	0.668	0.701	0.740	0.659	0.734		Small Size	9.99	8.75	8.84	9.16	12.99
2	0.870	0.875	0.891	0.841	0.876		2	14.64	9.18	13.97	14.08	21.79
3	1.066	1.049	1.015	1.026	1.015		3	17.92	18.98	29.14	27.12	26.29
4	1.172	1.079	1.044	1.014	1.045		4	26.75	33.62	21.46	22.84	34.68
Big Size	0.945	0.832	0.720	0.688	0.881		Big Size	17.40	21.77	14.65	15.96	29.96
R square (Fama - French regression)							Residual 【stander deviation】					
	Low Ratio	2	3	4	High Ratio			Low Ratio	2	3	4	High Ratio
Small Size	80%	81%	82%	80%	82%		Small Size	5.00%	5.03%	4.88%	5.01%	4.74%
2	81%	80%	84%	84%	87%		2	5.11%	5.35%	4.48%	4.32%	4.05%
3	81%	82%	83%	84%	87%		3	5.12%	4.67%	4.29%	4.10%	3.62%

4	80%	81%	81%	77%	88%		4	5.37%	4.68%	4.57%	4.84%	3.38%
Big Size	72%	82%	84%	87%	89%		Big Size	6.00%	4.16%	3.66%	3.18%	3.09%

In June of year t, we firstly separate list firms into 2 groups (small or big, S or B) by median market capitalization(total shares times the month end stock price) and reform the rank in July of year t+1. Based on EP , the earning to price ratio, in the year of t -1, we then separate list firms into 3 segments by 30^{th} and 70^{th} quintiles, we have the low ratio(L), middle ratio (N)and high ratio groups(H). Thus, we intersectionally have 6 grouped portfolios, such as, SL, SN, SH, BL,BN and BH, to construct SMB and HML. In the whole paper, monthly value weighted returns were calculated in each portfolio. The market risk premium was the difference between value weighted market return and three month fixed deposited rate.

We use the profitability(revenues minus cost of goods sold, minus selling, operating, and administrative expenses, minus account expense all divided by book equity) in end of year t-1 to divide sample into 3 groups by 30^{th} (Robust) and 70^{th} (Weak) percentiles. Based on the change ratios in the last two years, the investment was calculated by the total asset change ratio, then we separate them into 3 groups by 30^{th} (Conservative) and 70^{th} (Aggressive) percentiles. Again, we intersectionally have 6 portfolios by size(2 groups) and profitability(3 groups), and 6 group portfolios by size(2 groups) and investment(3 groups). Then, we have the RMW (Robust Minus Weak) and CMA (Conservative Minus Aggressive)

We use the same methodology to construct 25 portfolios by size(5 groups) and EP(5 groups).

Comparation between 3 and 5 factor model is quite interesting, there are only three significant intercepts in FF3 (EP ratios instead of BM ratios) and the average R square is nearly 87%, moreover, the average standard deviation of residuals is around 4.5%. However, there are 11 significant intercepts in FF5 (EP ratios instead of BM ratios) and the average R square is lower almost 4% than average R square of FF3, the average of residuals is around 4.5%. Therefore, empirically we conjecture that the performance of FF3 is better than the performance of FF5. We propose that the difference between China and U.S. stock markets is different, investment and profitability premium were constructed by the special and common features of public companies, however, these two additional factors can not fit in the emerging Chinese stock market. On another side of coin, the classic Fama and French three factors constructed by the size(market capitalization) and earning to price ratio deserves the trophy of horse racing. In addition, our findings are consist with several papers and researchers.

Table 3

In the first step of Fama MacBeth regression, by past 36 (min 24) months, we estimate pre-ranking betas for individual stocks. 36 intersections between size and CAMP betas portfolios were formed for estimating post-ranking betas. We calculated the equal-weighted monthly returns on portfolios for the next year, then we have post-ranking average return on 36 portfolios formed on size and pre-ranking CAMP betas. Finally, we use full sample period to estimate post-ranking betas by all the value weighted portfolios of stocks. In the end, these betas were used in the second step of Fama MacBeth cross-sectional regression in each time point for individual stocks.

	1	2	3	4
RP	-0.283*	-0.179	-0.429*	-0.334*
	(-2.23)	(-1.77)	(-2.54)	(-2.34)
SMB	-0.212*	-0.250*		
	(-2.23)	(-2.32)		
HML	0.409*		0.484*	
	2.56		2.62	
cons	-0.036	-0.043	-0.03	-0.037
	(-1.73)	(-1.97)	(-1.48)	(-1.76)
adjr2	0.025	0.019	0.017	0.01

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

We compute equal weighted return in this Fama MacBeth regression. These averages provide test to filter out the which independent variable has non-zero expected premiums. In table 3, we can clearly see all the time series average of the coefficients of month by month cross-sectional regression on size, beta and other factor/characteristics. The size and ratio premium play a very important role to explain the cross-sectional average returns. The negative sign and significant level on SMB no matter on which model, model of 1 – 4, do provide robustness evidences. Again, the positive sign and significant level on HML no matter on which model also provide robustness results.

Table 4

FF1993 – Fama MacBeth regression

	1	2	3	4	5	6

bRP	-0.011		-0.146*		0.075	0.022
	(-0.24)		(-2.60)		-1.83	-0.52
Lep		0.005**	0.005**			0.008***
		2.71	2.81			5.75
Lme				0.007***	0.008***	0.012***
				4.37	4.64	4.27
cons	0.015*	-0.018	-0.013	-0.145***	-0.159***	-0.298***
	-2.27	(-1.53)	(-1.16)	(-3.60)	(-3.94)	(-4.39)
adjr2	0.007	0.017	0.023	0.041	0.045	0.057
F	0.058	7.334	9.789	19.082	11.384	20.565

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

We use the same methodology to test the size and EP ratios, however, this time we traditionally replace the coefficients to Log value of all latent variables. Negative EP ratio was not allowed. At this table, we use the traditional size and betas of size to form 36 portfolios. Log value of market capitalization is Lme, Log value of EP is Lep, cons is the intercept for each model(1 – 4). The average coefficients is the time- series average of month by month cross-sectional regression from June 2003 to December 2018.

We therefore conclude from the table 4 that the size and EP ratios do provide significant explanatory power to the catch the average return. In particular, we didn't focus on the comparison between the EP, BM and other financially ratios, which was investigated by LSY(2019) who supporting the EP is the best characteristic. The market premium consists with the FF(1993), thus, the market beta does not help to explain average stock return.

Table 5

	1	2	3	4	5	6	7	8	9
RP	-0.004	-0.015		-0.008	-0.105	-0.094			
	(-0.08)	(-0.31)		(-0.15)	(-1.64)	(-1.48)			
SMB	-0.122**	-0.104*	-0.109*	-0.111*					
	(-2.68)	(-2.14)	(-2.08)	(-2.41)					
HML	-0.011				-0.019				
	(-0.41)				(-0.69)				
RMW	0.01			0.01	-0.154	-0.16	-0.19	-0.204	

	0.1			0.1	(-1.42)	(-1.44)	(-1.57)	(-1.57)	
CMA	-0.019			-0.015	-0.04	-0.041	-0.051		-0.054
	(-0.45)			(-0.36)	(-0.81)	(-0.84)	(-0.99)		(-0.97)
cons	0.021*	0.022**	0.022**	0.022**	0.022*	0.022**	0.024**	0.024**	0.023**
	-2.53	-2.67	-2.66	-2.61	-2.57	-2.65	-2.71	-2.73	-2.68
adjr2	0.03	0.023	0.021	0.028	0.02	0.017	0.01	0.005	0.007

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

In the first stage of Fama MacBeth regression, we separate sample into 6 groups by size(total share outstanding times monthly end stock price) on each June. The pre-ranking CAMP-bests were estimated by using the individual stocks and all value-weighted return portfolios and by past 36 (min 24) months. Then, we further separate each of the six-size group into 6 groups by using the pre-ranking CAMP-bests, thus we have 36 portfolios formed by size and CAMP-betas. We compute the equal-weighted return (post-ranking) on stock portfolios and run full sample (2003 - 2018) regression on market and other proxies for post-ranking betas.
In the second stage of Fama MacBeth regression, we cross-sectional estimate the time series average post-ranking betas on each of the time period.

There is evidence to say the investment and profitability does not make any contribution on explaining the average return, however, the HML, formed by EP ratios, also doesn't provide any explanatory power.

CONCLUSION

Many researches investigate the factors/characteristics model in developed markets, such as G7. However, we found limited researches focusing on emerging market especially on China stock market. By using the earning to price ratio instead of book to market ratio, we found out that the performance of FF3 is empirically better than the performance of FF5 and Chines-FF3 model do provide explanatory power to the average return in the tradition Fama MacBeth regression. Consistent with Zhao, Yan and Zhang (2016) and Liu, Stambaugh and Yuan(2019), the performance of both the RMW and CMA is neglectable.

As our results showing, the localized multi-factors model is needed to be developed especifically in China stock market. Different stock market has different features and commons, we may not use ruler to measure color difference. Moreover, in our 5-factor model, the HML is a redundancy factor/characteristic by using China data. Also, this finding is consistent with other group of Chinese researchers.

The further studies may focus on the common factors of China public companies. We

always saw the entirely market turn red(goes up) or green(goes down) in one day or certain period. Thus, this homogenous movement must be investigated in our further research. Because of some supportive policy designs, we may also see the abnormal benefits in stock market.

REFERENCES

1. Fama, E. F., & French, K. R. (2015).
   A five-factor asset pricing model.
   Journal of Financial Economics, 116(1), 1-22. doi:10.1016/j.jfineco.2014.10.010

2. Fama and French, 2012 E. Fama, K. French
   Size, value, and momentum in international stock returns
   Journal of Financial Economics, 105 (2012), pp. 457-472

3. Fama and French, 1995 E. Fama, K. French
   Size and book-to-market factors in earnings and returns
   Journal of Finance, 50 (1995), pp. 131-156

4. Fama and French, 1993 E. Fama, K. French
   Common risk factors in the returns on stocks and bonds
   Journal of Financial Economics, 33 (1993), pp. 3-56

5. Fama, E. F., & French, K. R. (1996).
   Multifactor Explanations of Asset Pricing Anomalies.
   Journal of Finance, 51(1), 55. doi:10.2307/2329302

6. Fama, E. F., & French, K. R. (1993).
   The Cross-Section of Stock Returns.
   Journal of Finance, 51(1993), pp. 427-465

7. Fama, E. F., & French, K. R. (2003).
   The Capital Asset Pricing Model: Theory and Evidence.
   Journal of Economic Perspectives, 25-46. doi:10.2139/ssrn.440920

8. Fama, E. F., & French, K. R. (2015).
   International Tests of a Five-Factor Asset Pricing Model.
   Journal of Financial Economics, 441-463. doi:10.2139/ssrn.2622782

9. Morck, R., Yeung, B. Y., & Yu, W. (1999). The Information Content of Stock Markets: Why Do Emerging Markets Have Synchronous Stock Price Movements? SSRN Electronic Journal. doi:10.2139/ssrn.194530

10. Griffin J. M. Are the Fama and Factors Global or Country Specific?[J]. Review of Financial Studies，2002，15(3)：783-803.

11. Sharpe W. F. Capital Asset Prices：A Theory of Market Equilibrium under Conditions of Risk[J]. Journal of Finance，1964，19(3)：425-42.

12. Fama, E. F., & Macbeth, J. D. (1972). Risk, return and equilibrium: Empirical tests. Place of publication not identified: Univ. of Chicago, Graduate School of Business.

13. Banz R. W. The Relationship between Return and Market Value of Common Stocks[J]. Journal of Financial Economics，1981，9(1)：3-18.

14. Carhart M. On Persistence in Mutual Fund Performance[J]. Journal of Finance，1997，52(1)：57-82.

15. Cooper M. J.，Gulen H.，Schill M. J. Asset Growth and the Cross-section of Stock Returns[J]. Journal of Finance，2008，63(4)：1609-51.

16. Novy-Marx R. Is Momentum Really Momentum?[J]. Journal of Financial Economics，2012，103(3)：429-53.

17. Aharoni G.，Grundy B.，Zeng Q. Stock Returns and the Miller Modigliani Valuation Formula：Revisiting the Fama French Analysis[J]. Journal of Financial Economics，2013，110(2)：347-57.

18. Titman S.，Wei K.，Xie F. Capital Investments and Stock Returns[J]. Journal of Financial and Quantitative Analysis，2004，39(4)：677-700.

19. Cooper I.，Priestley R. Real Investment and Risk Dynamics[J]. Journal of Financial Economics， 2011，101(1)：182-205.

20. Liu, J., Stambaugh, R., & Yuan, Y. (2019). Size and Value in China. Journal of Financial Economics, 134(1), 48–68. doi: https://doi.org/10.1016/j.jfineco.2019.03.008
21. Lee, C., Qu, Y., Shen, T., 2017. Reverse mergers, shell value, and regulation risk in Chinese equity markets. Unpublished working paper. Stanford University and Tsinghua University.
22. Stattman, D. (1980). Book values and stock returns. The Chicago MBA: A journal of selected papers, 4(1), 25-45.
23. (Zhao, Yan and Zhang 2016).