The Fama-French Three Factors in the Chinese Stock Market

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Jin Xu and Shaojun Zhang[1]

Abstract

China is the largest emerging market and attracts a great deal of attention from investors and researchers worldwide. The Fama-French three-factor model is the outcome of decades of research on US stock returns. To what extent the three factors explain the variation in Chinese stock returns is an intriguing question. This paper documents empirical evidence on this issue and identifies some pitfalls that arise in the application of the three-factor model to Chinese stock returns. We find that several special features in China affect the three factors considerably and also influence the explanatory power of the three-factor model.

Keywords: Chinese Stock Market, Non-Tradable Shares, Three-Factor Model, Value Premium
JEL Classification: G11, G12, G15

I.　Introduction

　　The Chinese stock market has a few special features that potentially affect the application of the Fama-French three-factor model to Chinese stock returns. First, before April 2005, about two thirds of outstanding shares in Chinese listed firms were held by government agencies or government-related enterprises and were non-tradable in the public market. The Chinese government started the share-structure reform in April 2005 to legally convert non-tradable shares to tradable shares. Almost all Chinese listed firms completed the reform by the end of 2006. Figure 1 shows the aggregate tradable market value and the aggregate total market value (both in RMB) for all A-shares of Chinese

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listed firms at the end of each month from December 1991 to December 2012. The tradable market value of a listed firm is the end-of-month market price times the number of tradable A-shares, while the total market value is the end-of-month market price times the number of all outstanding shares (including both tradable and non-tradable shares). We aggregate over all Chinese listed firms. As shown in Figure 1, the proportion of the aggregate tradable market value increases from about 30% in 1995 to above 80% in 2012. Figure 2 shows the five percentiles (5th, 25th, 50th, 75th, and 90th) of the cross-sectional distribution in the proportion of tradable shares across all Chinese listed firms in each month from December 1991 to December 2012. By the end of 2012, all outstanding shares are tradable for more than 25% of firms, but for another quarter of firms, more than 60% of shares are still non-tradable. The first issue we examine is whether the Fama-French three factors should be based on tradable shares or on all outstanding shares.

Figure 1   Market Value

This figure shows the total market value and the tradable market value in aggregate for all A-shares in China. The left axis is the amount of market value. The right axis is the ratio of the tradable market value to the total market value.
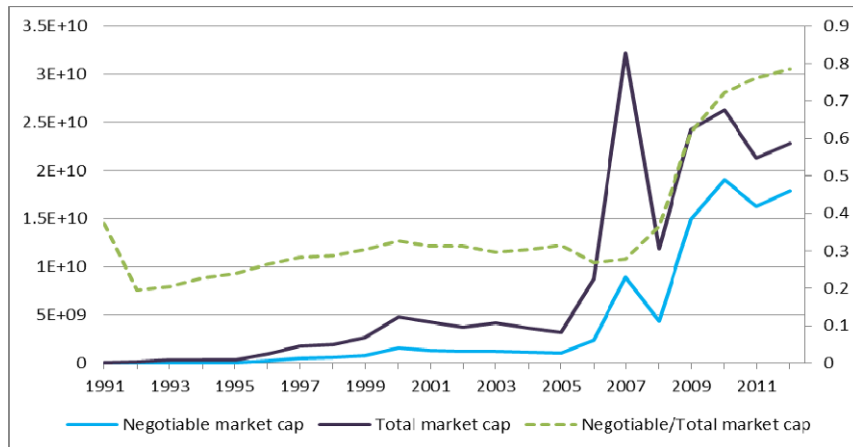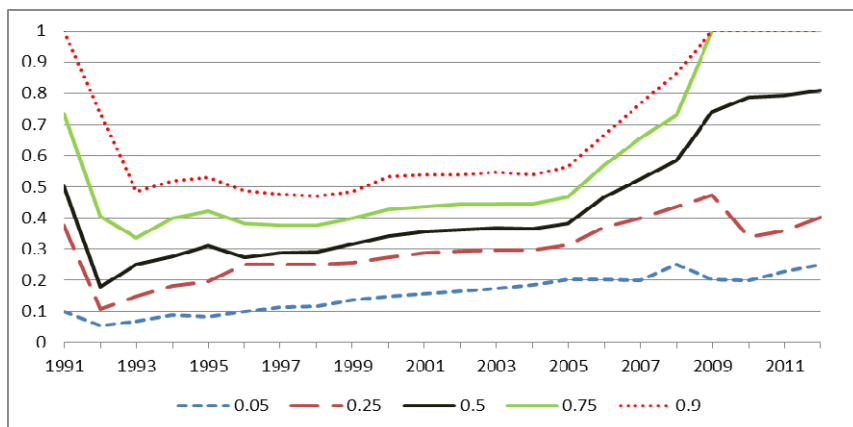

Figure 2   Percentiles of the Ratio of Tradable to Total Market Value

This figure shows the five percentiles (5%, 25%, 50%, 75%, 90%) of the firm-level ratio of tradable market value to total market value for all A-shares in China.

Second, China has two main boards for the listing of public firms, the Shanghai Stock Exchange and the Shenzhen Stock Exchange. In addition, the Small Medium Enterprise Board (SME) and the Growth Enterprise Board (GEB) were set up in May 2004 and October 2009, respectively; both are hosted by the Shenzhen Stock Exchange. Table 1 shows the total number of Chinese listed firms and the number of firms listed on the SME and GEB in each year from 1991 to 2012. At the end of 2012, there were 1,383 firms listed on the Shanghai and Shenzhen main boards and 1,049 firms listed on the SME and GEB. Fama and French (1992) use NYSE-listed firms to determine the breakpoints between small and big firms in order to avoid the overwhelming influence of the large number of small Nasdaq firms. It is unclear whether we should follow the same practice to exclude GEB and SME listed firms in determining the breakpoints for the size factor in China.

Table 1   Number of Chinese listed firms

The table below shows the number of Chinese listed firms in each year from 1991 to 2012. The Small Medium Enterprise Board (SME) and the Growth Enterprise Board (GEB) were set up in in Shenzhen in May 2004 and October 2009 respectively. The non SME/GEB stocks are listed on either the Shanghai Stock Exchange or the Shenzhen Stock Exchange.

Year	Total	SME&GEB	Non SME/GEB
1991	13	0	13
1992	52	0	52
1993	176	0	176
1994	288	0	288
1995	312	0	312
1996	515	0	515
1997	720	0	720
1998	825	0	825
1999	924	0	924
2000	1060	0	1060
2001	1136	0	1136
2002	1193	0	1193
2003	1259	0	1259
2004	1350	38	1312
2005	1340	50	1290
2006	1363	102	1261
2007	1440	200	1240
2008	1559	273	1286
2009	1662	363	1299
2010	1990	682	1308
2011	2267	922	1345
2012	2432	1049	1383

Third, more than 170 Chinese listed firms have issued multiple class shares that have the same cash flow and voting rights but are traded in different markets. Some have A-shares and B-shares, others have A-shares and H-shares, and the rest have A-shares and shares in other foreign markets.[2] Because these shares share the same cash flow and

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[2] Both A and B shares are listed in Chinese domestic exchanges. A-shares are denominated and traded in yuan, while B-shares are denominated and traded in USD or HKD. Foreign individual investors cannot buy A-shares. H-shares are listed in the Hong Kong Stock Exchange. Other foreign countries in which Chinese firms listed their shares include the US, the UK, Singapore, and Germany.

voting rights, they usually have the same claim on the firm's book value of equity. Hence, for Chinese domestic investors who invest only in A-shares, to obtain the book-to-market equity (BE/ME) ratio per A-share of a firm with multiple class shares, it is incorrect to divide the firm's total book value of equity from its balance sheet by the total market value of A-shares. The correct way is to calculate the book value of equity per share divided by the A-share price.

In this paper, we closely follow Fama and French (1993) to construct the market, size, and value factors on the basis of Chinese stock returns, with a particular focus on how the above-mentioned special features affect the three factors and the performance of the three-factor model. We find that these features considerably affect the three factors and also influence the explanatory power of the three-factor model. Specifically, our main findings are as follows.

First, the return on the market portfolio crucially depends on whether or not non-tradable shares are included in the market portfolio. Over the period between July 1996 and June 2003 inclusive, the monthly average excess return on the market portfolio including only tradable shares is 0.94%, while the monthly average excess return on the market portfolio including both tradable and non-tradable shares is only 0.75%. The difference of 19 basis points in monthly returns is economically significant.

Second, the explanatory power of the market model also depends on the definition of the market portfolio. The adjusted R squared of the market model is on average 82.9% when the market portfolio includes only tradable shares and decreases to 76.6% when the market portfolio includes both non-tradable and tradable shares.

Third, value firms earn significantly higher returns than growth firms in China. The monthly average return on the High Minus Low (HML) factor is 0.54% in China over the period between July 1996 and June 2003. By comparison, according to information on the three factors from Kenneth French's website, the average return on the HML factor is only 0.33% in the US over the period between July 1991 and June 2011.

Fourth, small firms earn significantly higher returns than large firms in China. The monthly average return on the Small Minus Big (SMB) factor is 0.82% in China over the period between July 1996 and June 2003. By comparison, according to information on the three factors from Kenneth French's website, the average return on the SMB factor is only 0.26% in the US over the period between July 1991 and June 2011.[3]

Last but not least, the average adjusted R squared of the three-factor model is greater than 93%, which is a substantial improvement over the explanatory power of the market model. The best performance of the three-factor model is achieved when the three factors are constructed by using the market portfolio that includes only tradable shares; using the total market value to divide firms into size groups and including the SME and GEB stocks to determine portfolio breakpoints; and using the book-value-to-price (B/P) ratio instead of the BE/ME ratio.

The rest of the paper is organised as follows: Section II gives a brief review of the relevant literature; Section III explains our data and methodology; Section IV presents our empirical results; and Section V concludes the paper.

II. Related Literature

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[3] Asness, Frazzini, and Pedersen (2013) find that the average monthly return on the SMB factor is 0.28% in the US between 1956 and 2012, but the alpha is 0.64% in the regression of the SMB factor return on the market excess return, the HML factor return, the UMD factor return, and the QMJ factor return.

The capital asset pricing model (CAPM) is a fundamental theory in modern finance. One key prediction of the CAPM is that a stock's systematic risk, captured by the slope coefficient (i.e. β) in the time-series regression of the stock's excess return on the market excess return, is the only factor that explains its expected return (Sharpe, 1964; Lintner, 1965). However, academic studies have documented ample evidence that β alone cannot adequately explain the variation in stock returns (see, for example, Fama and French, 1992 and references in Campbell, 2000).

Other asset pricing theories, such as the intertemporal capital asset pricing model (Merton, 1973) and the arbitrage pricing theory (Ross, 1976), suggest that there may be multiple systematic factors. However, these theories do not specify the factors explicitly. Many studies, for example, Connor and Korajczyk (1988), Lehmann and Modest (1988), and Chen, Roll, and Ross (1986), have attempted to identify pricing factors empirically. Fama and French (1993) developed an empirical asset pricing model that includes three factors: the market factor, a factor related to firm size, and a factor related to the ratio of the book value of equity to the market value of equity. They found that the three-factor model explains the variation in stock returns better than the CAPM and is able to explain several well-documented return anomalies. Since then, the three-factor model has been widely used in finance research (Campbell, 2000 and the Scientific Background on the Nobel Prize Winners in Economics, 2013).

In the following, we review a few studies that apply the Fama-French three-factor model to Chinese stock returns. We do not intend to give a comprehensive review of all studies that use the three-factor model for the China market. Our purpose is to highlight the lack of consistency in the construction of the three factors for Chinese stock returns.

Liao and Shen (2008) use the Fama-French three-factor model to examine stock price reaction to Chinese listed firms' completion of the split-share structure reform that was initiated in April 2005. To construct the size factor, they separate small and large stocks by the median of their tradable shares' market value, which is defined as the number of tradable shares at the beginning of each year multiplied by share price. To construct the value factor, they sort stocks into three groups by their BE/ME ratio. The ratio is computed as the net assets per share divided by share price. The intersection of the two size groups with the three BE/ME groups produces six portfolios. The portfolio returns are value-weighted by the tradable shares' market value, which implicitly assumes that the portfolios include only tradable shares.

Liu and Yang (2010) examine the explanatory power of the Fama-French three-factor model for Chinese bond returns. They find that two factors, SMB and HML, do not contribute significantly to explaining Chinese bond returns. To construct the size factor, they sort stocks by their total market value into two groups. They sort stocks by their price-to-book ratio into three groups. The portfolio returns are value-weighted by the total market value.

Chen (2004) examines the performance of the Fama-French three-factor model for Chinese A-shares. He sorts stocks by their tradable shares' market value into three size groups using breakpoints at the 30% and 70% percentiles. He sorts stocks by their BE/ME ratio into two groups. The portfolio returns are value-weighted by the tradable shares' market value.

Mao, Chen, and Yang (2008) apply the Fama-French three-factor model to study the long-run return performance after Chinese listed firms completed rights offering. To construct the three factors, they sort stocks (a) into two size groups by their tradable shares' market value and (b) into three groups by their BE/ME ratio. It is unclear how they calculate the value-weighted portfolio returns.

III. Data and Methodology

We follow Fama and French (1993) and use the CRSP/Compustat database to construct the three factors for the US market. For the China data, we use the CSMAR databases. The annual book value of equity is taken from the CSMAR China Stock Market Financial Statements Database. The monthly trading data, including closing price, total market value, tradable market value, and stock returns with cash dividend reinvested, are taken from the CSMAR China Stock Market Trading Database. The change in the total number of shares outstanding also comes from this database. We use the 3-month RMB deposit rates provided by the Industrial and Commercial Bank of China as the risk-free rate of return.[4]

We examine the performance of two asset pricing models – the CAPM model and the Fama-French three-factor model. We estimate the CAPM model as follows:

$$R_t - r_{ft} = \alpha + \beta(R_{mt} - r_{ft}) + e_t, \tag{1}$$

where R_t is the return on the test portfolios, R_{mt} is the market return, and r_{ft} is the risk-free rate. Although the Sharp-Lintner version of the CAPM stipulates the intercept to be zero, an intercept is usually included in empirical finance studies (Campbell, Lo, and MacKinlay, 1997, Chapter 5).

The Fama-French three-factor model is specified by the following equation:

$$R_t - r_{ft} = \alpha + \beta_1(R_{mt} - r_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + e_t, \tag{2}$$

where R_t is the return on the test portfolios, R_{mt} is the market return, r_{ft} is the risk-free rate, SMB_t is the return on the size factor, and HML_t is the return on the book-to-market factor. Fama and French (1993) construct the SMB factor as the return on a portfolio long in small stocks and short in large stocks and the HML factor as the return on a portfolio long in high BE/ME ratio stocks and short in low BE/ME ratio stocks.

We construct the Fama and French three factors for the Chinese stock market as follows. First, at the end of June of year t, we sort stocks by their total market value and divide them into two size groups: small (S) and big (B) firms. Fama and French (1993) determine the size breakpoint on the basis of NYSE-listed firms in order to avoid the overwhelming influence of the large number of small firms listed on the Nasdaq. We do not know how the stocks listed on the Chinese SME and GEB influence the three factors in China. Thus, we choose the size breakpoint in two ways: one is the median size including the SME/GEB stocks, and the other is the median size excluding the SME/GEB stocks.

Next, we note that for Chinese firms that have shares listed on different stock exchanges, for example, A-shares listed in the Chinese mainland, H-shares listed in Hong Kong, and N-shares listed in New York, it is incorrect to measure the BE/ME ratio of A-shares as the firm's total book value of equity from its balance sheet divided by the market value of A shares. Instead, we measure the B/P ratio of A-shares as the book value of equity per share divided by the end-of-year closing price of A-shares. The book value

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[4] The risk-free rate of return that is available from CSMAR database is based on the one-year fixed-term deposit rate or one-year treasury note issued by the Chinese Government. We choose the 3-month deposit rate to match the monthly returns under study. We cannot find a long series of the market-based interest rate such as SHIBOR that covers the whole time period under study.

of equity per share is equal to the total book value of equity divided by the total number of shares outstanding; both figures are available in the annual report. Table 2 shows the mean, median, and standard deviation of the B/P ratio, the BE/ME ratio, and the difference between the B/P ratio and the BE/ME ratio across all Chinese listed firms in each year from 1992 to 2012. The number of firms for which the B/P ratio differs from the BE/ME ratio gradually increases from 18 in 1992 to 174 in 2012.[5] To form the HML factor, we sort stocks by the B/P ratio at the end of December of year t-1 and divide them into three groups: low (L), medium (M), and high (H) firms. The breakpoints for the three groups are the 30th and 70th percentiles of the B/P ratios.

Table 2   Comparing the B/P ratio with the BE/ME ratio

This table reports the descriptive statistics of the book-value-to-price (B/P) ratio, the book-to-market equity (BE/ME) ratio, and the difference between the B/P ratio and the BE/ME ratio across firms in each year from 1992 to 2012.

| | | B/P ratio | | | BE/ME ratio | | | Difference (= B/P – BE/ME) | | | |
| | | | | | | | | Absolute diff. > 0.001 | | | |
Year	Total # of firms	Median	Mean	Std	Median	Mean	Std	# of firms	% of total	Mean	Std
1992	52	0.141	0.155	0.066	0.157	0.175	0.083	18	34.6%	-0.020	0.038
1993	176	0.253	0.257	0.084	0.272	0.276	0.099	38	21.6%	-0.019	0.043
1994	288	0.448	0.463	0.212	0.462	0.496	0.236	63	21.9%	-0.034	0.080
1995	312	0.512	0.561	0.256	0.551	0.606	0.285	70	22.4%	-0.045	0.100
1996	515	0.271	0.294	0.113	0.287	0.317	0.142	83	16.1%	-0.023	0.061
1997	720	0.261	0.271	0.111	0.266	0.290	0.141	93	12.9%	-0.019	0.058
1998	821	0.268	0.294	0.132	0.274	0.312	0.159	98	11.9%	-0.019	0.060
1999	913	0.259	0.276	0.135	0.266	0.291	0.155	99	10.8%	-0.015	0.051
2000	1046	0.180	0.194	0.096	0.184	0.203	0.109	101	9.7%	-0.009	0.034
2001	1117	0.248	0.265	0.128	0.255	0.278	0.143	112	10.0%	-0.013	0.046
2002	1173	0.339	0.354	0.172	0.349	0.370	0.186	113	9.6%	-0.015	0.056
2003	1229	0.422	0.438	0.189	0.436	0.455	0.200	115	9.4%	-0.017	0.063
2004	1316	0.524	0.552	0.244	0.540	0.572	0.260	115	8.7%	-0.020	0.079
2005	1284	0.665	0.712	0.337	0.686	0.738	0.362	114	8.9%	-0.026	0.108
2006	1314	0.474	0.506	0.270	0.485	0.526	0.288	120	9.1%	-0.020	0.079
2007	1409	0.190	0.212	0.114	0.196	0.224	0.172	139	9.9%	-0.012	0.126
2008	1521	0.521	0.563	0.305	0.532	0.594	0.468	144	9.5%	-0.031	0.346
2009	1612	0.236	0.263	0.141	0.243	0.280	0.290	146	9.1%	-0.017	0.244
2010	1954	0.245	0.290	0.185	0.248	0.309	0.408	158	8.1%	-0.019	0.350
2011	2236	0.425	0.470	0.255	0.430	0.493	0.478	160	7.2%	-0.023	0.388
2012	2414	0.466	0.504	0.266	0.471	0.529	0.519	174	7.2%	-0.025	0.428

After these two steps, we have two size groups and three B/P groups at the end of June of year t. The intersection of these groups forms six non-overlapping portfolios, denoted as (S, L), (S, M), (S, H), (B, L), (B, M), and (B, H). The portfolios remain the same from July of year t to June of year t+1. At the end of June of year t+1, we reconstruct the portfolios. We calculate the value-weighted monthly returns (with cash dividends reinvested) of each portfolio at the end of month t using their tradable (or total)

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[5] The proportion of such firms dropped from 34.6% in 1992 to 7.2% in 2012 as the total number of listed firms increases significantly over these years.

market value at the end of month t-1. The tradable market value is the end-of-month market price times the number of tradable A-shares, while the total market value is the end-of-month market price times the number of all outstanding shares (including both tradable and non-tradable shares).

Finally, we obtain the Fama-French three factors as follows. The market factor is equal to the value-weighted returns of all A-shares minus the risk-free rate. The SMB factor is then computed as the simple average of the monthly value-weighted returns of the three small-firm portfolios, (S, L), (S, M), and (S, H), minus the simple average of the monthly value-weighted returns of the three big-firm portfolios, (B, L), (B, M), and (B, H). Similarly, the HML factor is computed as the simple average of the monthly value-weighted returns of the two high-B/P groups, (S, H) and (B, H), minus the simple average of the monthly value-weighted returns of the two low-B/P groups, (S, L) and (B, L).

IV. Empirical Results

To understand the details of constructing the Fama-French three factors and to gain confidence in our programming and empirical work, we first use the CRSP/Compustat data to replicate the Fama and French three factors in the US. We compare the three factors we obtained with those on Kenneth French's website for the time period from July 1991 to June 2011. Table 3 shows the descriptive statistics of the three factors for the US stock returns. Figure 3 shows the time-series plot of the monthly cumulated value of one dollar invested in each of the three factors at the end of June 1991 and compounded at the monthly returns on the respective factor. We obtain almost exactly the same market factor as the one provided by Kenneth French, although there are small discrepancies in the SMB and HML factors. Figure 3 shows that all three of our factors track the changes in the respective factors from Kenneth French's website very closely.

Table 3   The Fama-French three factors for the US market

This table reports the descriptive statistics of the monthly returns on the Fama-French three factors in the US market. Panel A is for the three factors from Kenneth French's website, and Panel B is for the three factors that we construct from the CRSP/Compustat data. The Sharpe ratio is equal to the mean divided by the standard deviation. The cumulative wealth is the cumulated value of one dollar invested at the end of June 1991 and compounded at the monthly returns of each factor until the end of June 2011.

Panel A: The three factors from Kenneth French's website between July 1991 and June 2011			
	SMB	**HML**	**Rm-Rf**
Mean (%)	0.26	0.33	0.55
Standard Deviation (%)	3.50	3.39	4.42
Sharpe Ratio	0.07	0.10	0.12
Cumulative Wealth	1.63	1.93	2.98
Panel B: The three factors from our replication between July 1991 and June 2011			
	SMB	**HML**	**Rm-Rf**
Mean (%)	0.23	0.37	0.55
Standard Deviation (%)	3.56	3.43	4.40
Sharpe Ratio	0.06	0.11	0.13
Cumulative Wealth	1.49	2.12	2.95

Figure 3   Cumulative value of the three factors in the US

This figure plots the monthly cumulated value of one dollar invested at the end of June 1991 and compounded at the monthly returns of the three factors in the US market. The solid lines represent the three factors from Kenneth French's website. The dashed lines represent the three factors we replicated. The time period is from July 1991 to June 2011.
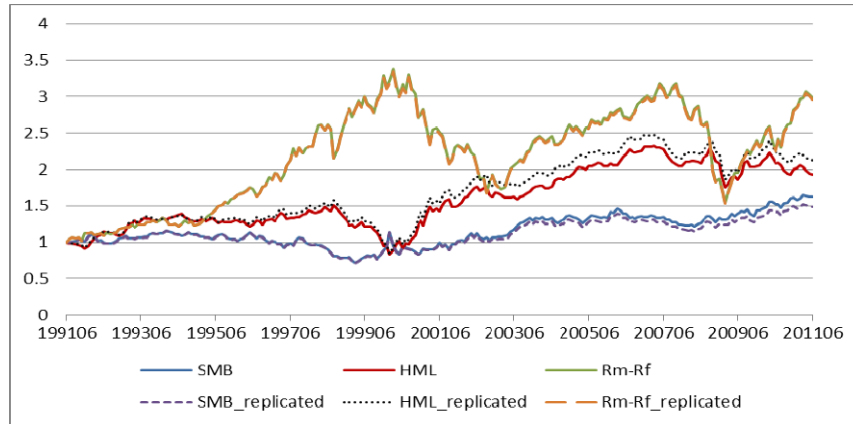
Next, we study the three factors for Chinese stock returns. We experiment with four ways of constructing the three factors to investigate the impact of the special features in the Chinese stock market. Almost all Chinese listed firms went through the share-structure reform in 2005 and 2006, which legally converted non-tradable shares to tradable shares. Figure 1 shows that the proportion of the tradable market value to the total market value increases from about 30% in 1996 to above 80% in 2012. We examine three time periods: the whole period from July 1996 to June 2013, the sub-period from July 1996 to December 2004, and the sub-period from July 2007 to June 2013. Hence, the two sub-periods allow us to observe potential differences in the three factors before and after the reform. Our analysis starts from July 1996 because we want to ensure that there are a sufficient number of stocks in each portfolio; Table 1 shows that the number of firms is small in the early years. Table 4 reports the descriptive statistics of the three factors under the four different methods in the three time periods. Figures 4.1, 4.2, and 4.3 show the time-series plots of the cumulated value of one dollar invested at the end of June 1996 and compounded at the monthly returns on the three factors.

To assess how well the three factors explain Chinese stock returns, we follow Fama and French (1993) to construct 25 portfolios and regress the excess returns of these portfolios on the three factors. To form the 25 portfolios at the end of June of year t, we sort stocks into five equal-size groups on the basis of their total market value at the end of June of year t and independently sort stocks into five equal-size groups on the basis of their B/P ratio at the end of December of year t-1. The intersection of these groups forms the 25 non-overlapping portfolios. The value-weighted monthly return of each portfolio in month t is equal to the sum of the monthly returns on the constituent stocks multiplied by their tradable market value at the end of month t-1. The excess return of each portfolio is equal to the value-weighted return of each portfolio minus the risk-free rate of return.

We first run regressions of the 25 portfolios on the basis of the market model in Equation (1). The regression results are shown in Tables 5.1 and 5.2. In Table 5.1, we use the tradable market value as weights to calculate the value-weighted market returns. In Table 5.2, we use the total market value as a weight to calculate the value-weighted market returns. The coefficients for the market factor are all highly significant at the 1%

Table 4   The Fama-French three factors for Chinese stock returns

This table reports the descriptive statistics of the monthly returns on the Fama-French three factors in China. The four panels represent the four different methods we use to construct the three factors, as indicated by the title of each panel. We examine three time periods: the whole period from July 1996 to June 2013, the first sub-period from July 1996 to December 2004, and the second sub-period from July 2007 to June 2013. The Sharpe ratio is equal to the mean divided by the standard deviation. The cumulative wealth is the cumulated value of one dollar invested at the end of June 1996 and compounded at the monthly returns of each factor until the end of June 2013.

	Whole period (1996/07-2013/06)			Sub-period (1996/07-2004/12)			Sub-period (2007/07-2013/06)		
	SMB	HML	Rm-Rf	SMB	HML	Rm-Rf	SMB	HML	Rm-Rf
Panel A: Including SME and GEB stocks and using tradable market value as a portfolio weight									
Mean (%)	0.82	0.54	0.94	0.82	1.02	0.61	1.26	-0.16	-0.14
Standard Deviation (%)	4.50	4.01	8.96	3.90	4.53	8.08	4.29	3.38	9.76
Sharpe Ratio	0.18	0.13	0.10	0.21	0.23	0.07	0.29	-0.05	-0.01
Cumulative Wealth	4.28	2.56	3.02	2.13	2.57	1.35	2.31	0.86	0.64
Panel B: Excluding SME and GEB stocks and using tradable market value as a portfolio weight									
Mean (%)	0.79	0.54	0.94	0.82	1.02	0.61	1.17	-0.14	-0.14
Standard Deviation (%)	4.53	4.07	8.96	3.89	4.53	8.08	4.44	3.54	9.76
Sharpe Ratio	0.17	0.13	0.10	0.21	0.23	0.07	0.26	-0.04	-0.01
Cumulative Wealth	4.03	2.56	3.02	2.13	2.57	1.35	2.16	0.87	0.64
Panel C: Including SME and GEB stocks and using total market value as a portfolio weight									
Mean (%)	0.87	0.55	0.75	0.80	1.09	0.54	1.37	-0.14	-0.39
Standard Deviation (%)	4.90	4.14	8.49	3.91	4.80	7.63	5.04	3.41	9.36
Sharpe Ratio	0.18	0.13	0.09	0.21	0.23	0.07	0.27	-0.04	-0.04
Cumulative Wealth	4.63	2.61	2.22	2.10	2.73	1.30	2.44	0.87	0.54
Panel D: Excluding SME and GEB stocks and using total market value as a portfolio weight									
Mean (%)	0.85	0.55	0.75	0.80	1.09	0.54	1.31	-0.15	-0.39
Standard Deviation (%)	4.95	4.20	8.49	3.90	4.80	7.63	5.16	3.59	9.36
Sharpe Ratio	0.17	0.13	0.09	0.21	0.23	0.07	0.25	-0.04	-0.04
Cumulative Wealth	4.41	2.57	2.22	2.10	2.73	1.30	2.32	0.86	0.54

Figure 4.1   Cumulative value of the size factor in China

The figure shows the time-series plot of the monthly cumulated value of one dollar invested at the end of June 1996 and compounded at the monthly returns of the size factor in China. The time period is from July 1996 to June 2013. Method 1 includes the SME and GEB stocks to determine the median firm size and uses a firm's tradable market value as a portfolio weight. Method 3 includes the SME and GEB stocks to determine the median firm size and uses a firm's total market value as a portfolio weight.

Figure 4.2   Cumulative wealth of the value factor in China

The figure shows the time-series plot of the monthly cumulated value of one dollar invested at the end of June 1996 and compounded at the monthly returns of the value factor in China. The time period is from July 1996 to June 2013. Method 1 includes the SME and GEB stocks to determine the median firm size and uses a firm's tradable market value as a portfolio weight. Method 3 includes the SME and GEB stocks to determine the median firm size and uses a firm's total market value as a portfolio weight.
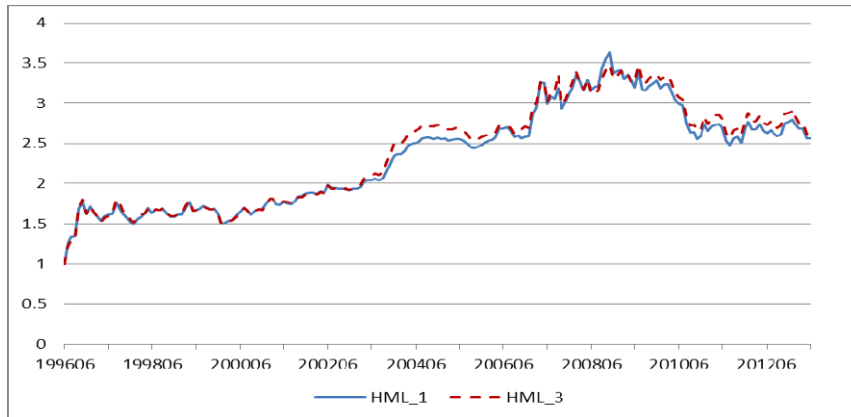
Figure 4.3   Cumulative value of the market factor in China

The figure shows the time-series plot of the monthly cumulated value of one dollar invested at the end of June 1996 and compounded at the monthly returns of the market factor in China. The time period is from July 1996 to June 2013. Method 1 includes the SME and GEB stocks to determine the median firm size and uses a firm's tradable market value as a portfolio weight. Method 3 includes the SME and GEB stocks to determine the median firm size and uses a firm's total market value as a portfolio weight.
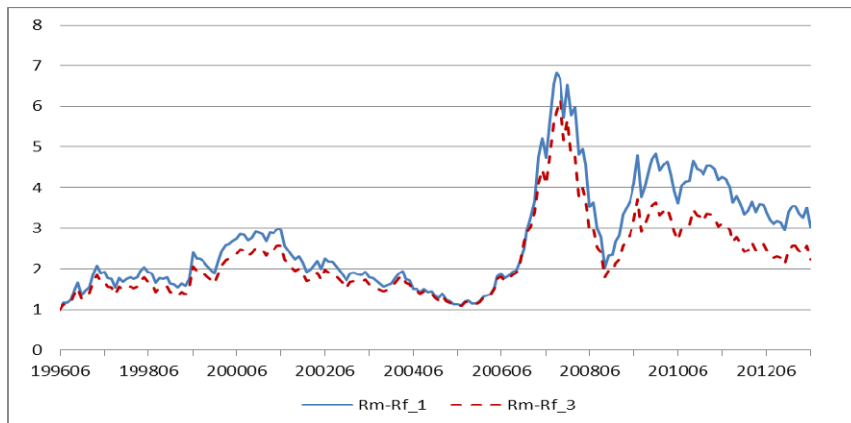
level in both tables. The average adjusted R squared across the 25 portfolios is 82.9% when the market portfolio includes only tradable shares, whereas the average adjusted R squared is 76.6% when the market portfolio includes both non-tradable and tradable shares. However, the market model does not explain small firms' returns properly as the intercepts are significantly positive for four of the five small firm portfolios.

Next, we run regressions of the 25 portfolios on the three factors as in Equation (2). Table 6.1 reports the regression results obtained by using a firm's tradable market value as a portfolio weight in the calculation of value-weighted returns and including the SME and GEB stocks to determine the portfolio breakpoints. In Table 6.1, the coefficients for

Table 5.1   The market model in China (I)

This table shows the results of regressing the excess returns of the 25 test portfolios on the market excess returns in China. The market returns are value-weighted by each firm's tradable market value.

Size quintiles	Value quintiles					Value quintiles				
	Low	2	3	4	High	Low	2	3	4	High
	Estimate					t-statistic				
Panel A: Intercept										
Small	0.675	0.849	0.966	1.187	1.103	1.779	2.358	2.595	2.750	2.710
2	0.050	0.519	0.502	0.718	0.828	0.141	1.660	1.600	1.865	2.467
3	-0.110	0.166	0.326	0.435	0.492	-0.352	0.570	1.242	1.416	1.430
4	0.057	-0.063	0.129	-0.045	0.110	0.206	-0.240	0.584	-0.200	0.488
Big	-0.482	-0.520	-0.262	-0.047	0.207	-1.691	-2.358	-1.111	-0.228	0.861
Panel B: Coefficient on Rm-Rf										
Small	1.053	1.053	1.088	1.175	1.188	24.939	26.294	26.292	24.478	26.245
2	1.037	1.048	1.064	1.128	1.155	26.157	30.156	30.515	26.343	30.932
3	0.987	1.055	1.097	1.123	1.155	28.384	32.545	37.587	32.920	30.202
4	0.973	1.003	1.047	1.085	1.137	31.581	34.225	42.774	43.421	45.185
Big	0.900	0.962	1.002	0.989	0.990	28.403	39.233	38.241	42.998	37.046
Panel C: Adjusted R-squared										
Small	0.754	0.773	0.773	0.747	0.772					
2	0.771	0.817	0.821	0.773	0.825					
3	0.799	0.839	0.874	0.842	0.818					
4	0.831	0.852	0.900	0.903	0.910					
Big	0.799	0.883	0.878	0.901	0.871					

Table 5.2   The market model in China (II)

This table shows the results of regressing the excess returns of the 25 test portfolios on the market excess returns in China. The market returns are value-weighted by each firm's total market value.

Size quintiles	Value quintiles					Value quintiles				
	Low	2	3	4	High	Low	2	3	4	High
	Estimate					t-statistic				
Panel A: Intercept										
Small	0.893	1.018	1.183	1.480	1.378	2.044	2.432	2.725	3.027	2.931
2	0.330	0.706	0.764	0.942	1.020	0.800	1.909	1.993	2.119	2.528
3	0.094	0.369	0.548	0.713	0.728	0.252	1.072	1.709	1.905	1.751
4	0.121	0.071	0.338	0.162	0.317	0.385	0.246	1.214	0.538	1.071
Big	-0.344	-0.397	-0.094	0.012	0.413	-1.340	-1.971	-0.387	0.047	1.562
Panel B: Coefficient on Rm-Rf										
Small	1.037	1.042	1.088	1.162	1.187	20.168	21.158	21.297	20.210	21.464
2	1.033	1.043	1.066	1.132	1.144	21.318	23.963	23.645	21.650	24.102
3	0.986	1.041	1.097	1.126	1.151	22.502	25.722	29.110	25.565	23.548
4	0.986	1.003	1.055	1.084	1.129	26.688	29.448	32.163	30.657	32.395
Big	0.940	0.986	1.001	1.002	1.011	31.132	41.636	35.088	34.155	32.539
Panel C: Adjusted R-squared										
Small	0.667	0.688	0.690	0.667	0.694					
2	0.691	0.738	0.733	0.697	0.741					
3	0.713	0.765	0.807	0.763	0.732					
4	0.778	0.810	0.836	0.822	0.838					
Big	0.827	0.895	0.858	0.852	0.839					

the SMB and market factors are all significant at the 5% level; the coefficients for the HML factors are significant at the 5% level except for three portfolios. The average adjusted R squared is equal to 93.6%. The intercepts are significant at the 5% level for 2 out of the 25 portfolios.

Table 6.1   The Fama-French three-factor model in China (I)

This table shows the results of regressing excess stock returns of the 25 portfolios on the Fama-French three factors in China. SME and GEB stocks are included to determine the portfolio breakpoints. The Fama-French three factors are constructed by using tradable market value as a portfolio weight.

Size quintiles	Value quintiles					Value quintiles				
	Low	2	3	4	High	Low	2	3	4	High
	Estimate					t-statistic				
Panel A: Intercept										
Small	0.056	0.299	0.208	0.200	0.169	1.766	1.261	1.017	0.886	
2	-0.301	0.047	-0.105	-0.130	0.058	-1.564	0.281	-0.664	-0.645	0.356
3	-0.441	-0.261	0.060	-0.182	-0.292	-2.214	-1.393	0.304	-0.920	-1.782
4	0.031	-0.319	-0.095	-0.422	-0.224	0.142	-1.392	-0.503	-2.418	-1.186
Big	0.039	-0.144	0.025	0.014	0.240	0.216	-0.868	0.119	0.073	1.400
Panel B: Coefficient on SMB										
Small	1.086	1.026	1.087	1.134	1.025	26.167	26.823	29.117	25.513	23.788
2	0.889	0.856	0.885	0.963	0.792	20.435	22.487	24.667	21.132	21.687
3	0.745	0.737	0.552	0.660	0.696	16.510	17.383	12.319	14.722	18.752
4	0.381	0.450	0.389	0.414	0.284	7.770	8.688	9.111	10.496	6.651
Big	-0.320	-0.296	-0.340	-0.252	-0.374	-7.832	-7.925	-7.125	-5.992	-9.623
Panel C: Coefficient on HML										
Small	-0.377	-0.437	-0.060	0.390	0.448	-8.017	-10.066	-1.413	7.751	9.180
2	-0.668	-0.337	-0.073	0.353	0.458	-13.556	-7.800	-1.802	6.836	11.066
3	-0.473	-0.240	-0.305	0.324	0.648	-9.261	-5.006	-6.006	6.373	15.413
4	-0.571	-0.159	-0.131	0.179	0.297	-10.287	-2.708	-2.714	4.012	6.141
Big	-0.667	-0.374	-0.095	0.278	0.544	-14.403	-8.816	-1.756	5.844	12.344
Panel D: Coefficient on Rm-Rf										
Small	0.986	0.999	0.986	1.019	1.036	47.095	51.711	52.355	45.440	47.656
2	1.021	0.999	0.983	0.993	1.026	46.528	52.000	54.295	43.204	55.613
3	0.964	1.007	1.075	1.022	1.014	42.347	47.116	47.534	45.186	54.142
4	0.998	0.975	1.023	1.024	1.076	40.353	37.323	47.462	51.394	49.919
Big	1.005	1.033	1.047	0.984	0.968	48.763	54.707	43.436	46.419	49.355
Panel E: Adjusted R-squared										
Small	0.944	0.952	0.957	0.949	0.952					
2	0.936	0.949	0.956	0.940	0.961					
3	0.921	0.936	0.931	0.936	0.960					
4	0.900	0.892	0.929	0.943	0.939					
Big	0.922	0.937	0.905	0.923	0.936					

Table 6.2 shows the regression results obtained by using a firm's tradable market value as a portfolio weight in the calculation of value-weighted returns and excluding the SME and GEB stocks to determine the portfolio breakpoints. The results are very similar to those in Table 6.1. The average adjusted R squared in Table 6.2 is equal to 93.7%.

Table 6.3 shows the regression results obtained by using a firm's total market value as a portfolio weight in the calculation of value-weighted returns and including the SME and GEB stocks to determine the portfolio breakpoints, while Table 6.4 shows the results

obtained by using a firm's total market value as a portfolio weight and excluding the SME and GEB stocks to determine the portfolio breakpoints. The average adjusted R squares are equal to 92.3% and 92.4% in Tables 6.3 and 6.4, which are lower than the corresponding figures in Tables 6.1 and 6.2.

Table 6.2   The Fama-French three-factor model in China (II)

This table shows the results of regressing excess stock returns of the 25 portfolios on the Fama-French three factors in China. SME and GEB stocks are excluded to determine the portfolio breakpoints. The Fama-French three factors are constructed by using tradable market value as a portfolio weight.

Size	Value quintiles					Value quintiles				
quintiles	Low	2	3	4	High	Low	2	3	4	High
	Estimate					t-statistic				
Panel A: Intercept										
Small	0.080	0.307	0.221	0.192	0.135	0.436	1.792	1.324	0.994	0.698
2	-0.193	0.091	-0.079	-0.136	0.110	-0.991	0.570	-0.512	-0.677	0.718
3	-0.542	-0.262	0.088	-0.186	-0.305	-2.675	-1.425	0.435	-0.998	-1.932
4	0.032	-0.403	-0.130	-0.488	-0.247	0.150	-1.812	-0.725	-2.875	-1.364
Big	0.016	-0.106	-0.005	0.062	0.225	0.088	-0.630	-0.022	0.345	1.284
Panel B: Coefficient on SMB										
Small	1.064	1.011	1.053	1.142	1.017	25.847	26.335	28.194	26.407	23.545
2	0.841	0.821	0.853	0.973	0.771	19.264	22.990	24.789	21.687	22.448
3	0.743	0.701	0.566	0.618	0.679	16.387	17.041	12.536	14.834	19.199
4	0.375	0.444	0.348	0.368	0.259	7.781	8.928	8.651	9.683	6.393
Big	-0.334	-0.312	-0.361	-0.266	-0.382	-8.065	-8.238	-7.505	-6.564	-9.731
Panel C: Coefficient on HML										
Small	-0.351	-0.393	-0.016	0.380	0.476	-7.570	-9.097	-0.388	7.809	9.796
2	-0.634	-0.322	-0.059	0.380	0.491	-12.888	-8.002	-1.512	7.513	12.686
3	-0.450	-0.209	-0.302	0.354	0.661	-8.813	-4.508	-5.947	7.549	16.599
4	-0.571	-0.136	-0.137	0.237	0.333	-10.529	-2.433	-3.030	5.538	7.288
Big	-0.639	-0.369	-0.055	0.295	0.546	-13.680	-8.653	-1.016	6.486	12.356
Panel D: Coefficient on Rm-Rf										
Small	0.989	1.000	0.989	1.004	1.022	46.921	50.864	51.715	45.317	46.219
2	1.014	1.004	0.978	0.991	1.021	45.320	54.882	55.515	43.104	58.014
3	0.948	0.993	1.071	1.029	1.007	40.794	47.107	46.283	48.237	55.592
4	1.000	0.982	1.040	1.043	1.064	40.542	38.507	50.493	53.563	51.172
Big	1.006	1.032	1.050	0.957	0.970	47.397	53.267	42.546	46.202	48.241
Panel E: Adjusted R-squared										
Small	0.944	0.951	0.956	0.950	0.950					
2	0.932	0.954	0.958	0.941	0.964					
3	0.917	0.936	0.928	0.944	0.962					
4	0.901	0.899	0.936	0.948	0.943					
Big	0.917	0.933	0.903	0.923	0.934					

Overall, these results demonstrate that the Fama-French three-factor model explains the variation in Chinese stock returns very well. It does not affect the explanatory power of the three-factor model whether or not the SME and GEB stocks are included to determine the portfolio breakpoints. The explanatory power of the three-factor model is higher when the market portfolio includes only tradable shares than when the market portfolio includes both non-tradable and tradable shares.

Table 6.3   The Fama-French three-factor model in China (III)

This table shows the results of regressing excess stock returns of the 25 portfolios on the Fama-French three factors in China. SME and GEB stocks are included to determine the portfolio breakpoints. The Fama-French three factors are constructed by using total market value as a portfolio weight.

Size quintiles	Value quintiles					Value quintiles				
	Low	2	3	4	High	Low	2	3	4	High
	Estimate					t-statistic				
Panel A: Intercept										
Small	0.095	0.309	0.218	0.306	0.247	0.469	1.650	1.289	1.522	1.217
2	-0.219	0.095	-0.025	-0.116	0.041	-1.038	0.490	-0.140	-0.589	0.243
3	-0.429	-0.204	0.012	-0.124	-0.279	-2.009	-1.039	0.063	-0.608	-1.536
4	-0.097	-0.280	-0.083	-0.434	-0.241	-0.423	-1.308	-0.409	-2.153	-1.121
Big	0.056	-0.190	0.085	-0.116	0.288	0.307	-1.011	0.357	-0.505	1.421
Panel B: Coefficient on SMB										
Small	1.160	1.113	1.168	1.194	1.099	27.883	28.902	33.521	28.886	26.343
2	1.018	0.941	0.999	1.051	0.946	23.443	23.591	26.736	25.985	27.413
3	0.896	0.849	0.773	0.827	0.835	20.404	21.062	19.573	19.699	22.367
4	0.569	0.585	0.582	0.606	0.501	12.103	13.273	13.910	14.624	11.300
Big	-0.143	-0.129	-0.192	-0.070	-0.204	-3.832	-3.338	-3.930	-1.490	-4.884
Panel C: Coefficient on HML										
Small	-0.286	-0.393	0.050	0.447	0.518	-5.737	-8.541	1.196	9.032	10.385
2	-0.571	-0.309	-0.034	0.442	0.457	-10.984	-6.467	-0.757	9.132	11.050
3	-0.420	-0.235	-0.183	0.359	0.701	-7.988	-4.876	-3.874	7.143	15.697
4	-0.507	-0.252	-0.099	0.225	0.327	-9.006	-4.782	-1.983	4.534	6.168
Big	-0.598	-0.215	-0.051	0.387	0.607	-13.384	-4.644	-0.863	6.853	12.176
Panel D: Coefficient on Rm-Rf										
Small	0.962	0.982	0.978	1.009	1.036	39.974	44.104	48.492	42.204	42.915
2	1.001	0.990	0.979	0.992	1.013	39.830	42.895	45.284	42.374	50.694
3	0.948	0.989	1.046	1.015	1.004	37.300	42.388	45.805	41.761	46.489
4	0.987	0.976	1.013	1.006	1.051	36.277	38.287	41.853	41.968	40.987
Big	1.015	1.020	1.024	0.969	0.967	46.937	45.504	36.176	35.450	40.119
Panel E: Adjusted R-squared										
Small	0.931	0.940	0.955	0.946	0.945					
2	0.922	0.931	0.942	0.943	0.957					
3	0.909	0.926	0.933	0.932	0.951					
4	0.887	0.900	0.916	0.923	0.917					
Big	0.916	0.911	0.869	0.879	0.909					

Table 6.4   The Fama-French three-factor model in China (IV)

This table shows the results of regressing excess stock returns of the 25 portfolios on the Fama-French three factors in China. SME and GEB stocks are excluded to determine the portfolio breakpoints. The Fama-French three factors are constructed by using total market value as a portfolio weight.

Size quintiles	Value quintiles					Value quintiles				
	Low	2	3	4	High	Low	2	3	4	High
	Estimate					t-statistic				
Panel A: Intercept										
Small	0.122	0.316	0.211	0.320	0.226	0.607	1.633	1.198	1.619	1.091
2	-0.115	0.122	0.014	-0.127	0.095	-0.536	0.661	0.080	-0.651	0.599
3	-0.548	-0.180	0.010	-0.149	-0.297	-2.565	-0.946	0.050	-0.753	-1.674
4	-0.088	-0.334	-0.132	-0.457	-0.270	-0.390	-1.570	-0.669	-2.241	-1.290
Big	0.037	-0.176	0.040	-0.063	0.297	0.199	-0.935	0.164	-0.278	1.432

Panel B: Coefficient on SMB										
Small	1.144	1.099	1.142	1.190	1.088	27.926	27.884	31.906	29.626	25.778
2	0.973	0.910	0.964	1.060	0.919	22.358	24.128	26.759	26.776	28.500
3	0.881	0.801	0.774	0.795	0.820	20.259	20.672	19.517	19.776	22.712
4	0.556	0.580	0.542	0.553	0.479	12.097	13.395	13.562	13.320	11.233
Big	-0.165	-0.140	-0.213	-0.088	-0.206	-4.401	-3.639	-4.324	-1.915	-4.900
Panel C: Coefficient on HML										
Small	-0.264	-0.349	0.085	0.440	0.539	-5.413	-7.441	1.998	9.216	10.734
2	-0.544	-0.291	-0.013	0.471	0.499	-10.508	-6.481	-0.310	9.992	13.029
3	-0.402	-0.206	-0.172	0.391	0.713	-7.769	-4.479	-3.642	8.177	16.604
4	-0.501	-0.237	-0.089	0.280	0.359	-9.158	-4.594	-1.876	5.683	7.069
Big	-0.573	-0.201	-0.011	0.411	0.610	-12.812	-4.417	-0.193	7.533	12.177
Panel D: Coefficient on Rm-Rf										
Small	0.962	0.983	0.977	0.994	1.023	40.029	42.477	46.500	42.185	41.275
2	1.003	0.993	0.977	0.986	1.010	39.238	44.860	46.196	42.406	53.346
3	0.930	0.975	1.041	1.017	0.996	36.436	42.860	44.720	43.129	47.010
4	0.990	0.981	1.028	1.028	1.039	36.662	38.602	43.784	42.208	41.507
Big	1.014	1.019	1.024	0.948	0.965	45.929	45.276	35.367	35.185	39.009
Panel E: Adjusted R-squared										
Small	0.932	0.936	0.951	0.947	0.942					
2	0.919	0.936	0.944	0.944	0.961					
3	0.907	0.928	0.931	0.936	0.952					
4	0.889	0.902	0.922	0.923	0.920					
Big	0.913	0.911	0.864	0.879	0.905					

Furthermore, we explore whether the US factors have any impact on Chinese stock returns. In Table A1 of the Appendix, we report the results that include the Fama-French three factors for both China and the US in the regressions of the 25 test portfolio returns. By comparing the results in Table A1 with those in Table 6.1, we do not find evidence that the US factors affect Chinese stock returns. The average adjusted R squared is equal to 93.6%.

V. Conclusion

We investigate the Fama-French three factors in the Chinese stock market and find that the three-factor model can explain more than 93% of the variation in the portfolio returns on Chinese A-shares. We experiment with different ways of constructing the three factors in order to evaluate the effect of several special features in China. Our results demonstrate that the formation of the three factors can have a big impact in empirical studies that apply the Fama-French three-factor model to Chinese stock returns. We recommend that the three factors be constructed by using the market portfolio that includes only tradable shares; using the total market value to divide firms into size groups and including the SME and GEB stocks to determine the portfolio breakpoints; and using the B/P ratio instead of the BE/ME ratio.

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Appendix

Table A1 The regressions with the Fama-French three factors in both China and the US

Size quintiles	Value quintiles					Value quintiles				
	Low	2	3	4	High	Low	2	3	4	High
	Estimate					**t-statistic**				
Panel A: Intercept										
Small	0.079	0.352	0.170	0.173	0.203	0.426	2.054	1.045	0.863	1.051
2	-0.303	0.052	-0.099	-0.146	0.066	-1.568	0.300	-0.615	-0.712	0.402
3	-0.448	-0.245	0.079	-0.154	-0.309	-2.214	-1.287	0.392	-0.771	-1.855
4	0.008	-0.300	-0.080	-0.441	-0.205	0.038	-1.294	-0.424	-2.476	-1.067
Big	0.063	-0.152	0.060	-0.021	0.213	0.341	-0.908	0.277	-0.112	1.217
Panel B: Coefficient on Chinese SMB										
Small	1.085	1.016	1.108	1.136	1.018	25.950	26.291	30.193	25.091	23.312
2	0.893	0.857	0.887	0.956	0.796	20.496	22.075	24.304	20.689	21.388
3	0.751	0.740	0.546	0.667	0.703	16.448	17.200	11.959	14.783	18.704
4	0.401	0.454	0.398	0.414	0.282	8.299	8.667	9.344	10.316	6.500
Big	-0.319	-0.287	-0.344	-0.254	-0.367	-7.678	-7.588	-7.091	-5.965	-9.296
Panel C: Coefficient on Chinese HML										
Small	-0.368	-0.441	-0.051	0.390	0.450	-7.815	-10.131	-1.239	7.639	9.147
2	-0.676	-0.334	-0.075	0.347	0.461	-13.780	-7.647	-1.815	6.669	10.999
3	-0.475	-0.240	-0.309	0.325	0.649	-9.239	-4.962	-6.013	6.389	15.325
4	-0.570	-0.163	-0.134	0.176	0.291	-10.488	-2.758	-2.785	3.883	5.968
Big	-0.666	-0.370	-0.098	0.274	0.549	-14.238	-8.695	-1.798	5.703	12.349
Panel D: Coefficient on Chinese Rm-Rf										
Small	0.981	1.004	0.983	1.017	1.036	46.102	51.057	52.657	44.171	46.612
2	1.029	0.998	0.986	0.994	1.026	46.428	50.526	53.070	42.229	54.179
3	0.968	1.011	1.078	1.027	1.014	41.621	46.160	46.428	44.752	52.974
4	1.003	0.982	1.030	1.025	1.082	40.812	36.855	47.529	50.142	49.061
Big	1.008	1.033	1.052	0.983	0.963	47.675	53.687	42.548	45.363	47.952
Panel E: Coefficient on US SMB										
Small	-0.071	-0.071	0.160	0.023	-0.086	-1.322	-1.415	3.374	0.398	-1.531
2	0.109	-0.010	0.033	-0.027	0.014	1.931	-0.202	0.707	-0.453	0.297
3	0.087	0.041	-0.038	0.073	0.074	1.477	0.745	-0.649	1.261	1.528
4	0.211	0.078	0.118	0.027	0.023	3.377	1.146	2.150	0.525	0.419
Big	0.010	0.078	-0.016	0.009	0.032	0.185	1.603	-0.251	0.156	0.627
Panel F: Coefficient on US HML										
Small	-0.090	-0.034	-0.037	0.044	-0.051	-1.597	-0.658	-0.755	0.718	-0.872
2	0.045	-0.022	-0.005	0.073	-0.037	0.764	-0.420	-0.101	1.184	-0.739
3	0.009	-0.031	0.008	-0.065	0.004	0.146	-0.538	0.136	-1.074	0.070
4	-0.012	-0.013	-0.028	0.054	0.012	-0.185	-0.190	-0.496	0.995	0.205
Big	-0.042	-0.028	-0.025	0.089	-0.005	-0.760	-0.554	-0.385	1.551	-0.088
Panel G: Coefficient on US Rm-Rf										
Small	0.044	-0.041	-0.016	0.017	0.013	1.092	-1.113	-0.462	0.383	0.318
2	-0.089	0.008	-0.032	0.016	-0.010	-2.130	0.218	-0.906	0.367	-0.287
3	-0.049	-0.044	-0.015	-0.075	-0.018	-1.130	-1.067	-0.352	-1.734	-0.503
4	-0.091	-0.081	-0.096	-0.006	-0.058	-1.980	-1.626	-2.347	-0.149	-1.395
Big	-0.034	-0.023	-0.045	0.022	0.034	-0.855	-0.639	-0.979	0.539	0.914
Panel H: Adjusted R-squared										
Small	0.945	0.952	0.959	0.949	0.952					
2	0.937	0.948	0.955	0.940	0.960					
3	0.921	0.935	0.930	0.937	0.960					
4	0.905	0.892	0.931	0.943	0.939					
Big	0.921	0.937	0.904	0.923	0.936					