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The Cross-Section and Cyclical Analysis of Expected Stock Returns: Evidence from China's A-Share Market

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Abstract

This paper investigates the factors which capture the cross-sectional variation in average monthly stock returns on Chinese main board A-share stock market from 1999 to 2014. Using univariate sorting test, univariate and multivariate cross-sectional regressions, we fail to find any relationship between beta and stock returns. However, we find that there are positive liquidity and size effects in China's A-share market, and liquidity in our test has the strongest power to explain the stock returns which very few researchers have ever found. Additionally, we find no relationship between stock returns and E/P, C/P and D/P. Finally, significant factors vary across China's stock market cycles, bear market and bull market, but it still stands in the cyclical tests that liquidity is the most explanatory factor of stock returns.

Keywords: cross-sectional regressions, firm factors, Chinese stock market, liquidity, book-to-market equity.

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Introduction

The fundamental research on factors which capture the cross-sectional variation in average stock monthly returns can be traced back to Sharpe (1964) and Lintner (1965) who initially developed the Capital Asset Price Model (CAPM). CAPM implies that there is a solely linear relationship between expected return of an asset and its systematic risk measured by beta, because portfolio selection can diversify the asset's unsystematic risk. Black et al. (1972) confirm the validity of CAPM by testing the monthly cross-sectional stock returns of US stock market from 1926 to 1966. They show that there is a positive linear relationship between beta and stock returns. The same conclusions are found by testing the US stock market in other studies (Fama and MacBeth, 1973; Ang and Chen, 2007). However, a lot of arguments about the validity of CAPM have been proposed, of which the two below are prominent. The first one is challenged by Roll (1977) who doubts the market portfolio's mean-variance-efficient hypothesis in CAPM. The second one is proposed by Pettengill *et al*. (1995) who point out that the invalidity of the CAPM lies in its assumption that the return premiums of both the market portfolio and asset are based on expectation rather than realization, suggesting that the market portfolio return impossibly always exceeds the risk-free rate as it is measured by reality. Some other studies also prove the weak role of beta in explaining the asset's return. For example, the arbitrage pricing theory (APT) initially developed by Ross (1973, 1976) who contends that there exists unknown numbers of unspecified factors affecting the asset's return, rather than the beta exclusively. Using the approach of Fama and MacBeth (1973), Fama and French (1992) also fail to find either descriptively or statistically significant relationship between beta and asset return when testing the US stock market from 1963 to 1990. However, they prove a strong validity of size and book-to-market equity in explaining the cross-sectional variation in average returns.

In addition to the beta, two other main factors have been widely used to explain the stock return: market equity (ME) and book-to-market equity (BE/ME). Among plenty of literatures on factors, a three factors model proposed by Fama and French (1993) is well-known. It shows that firm size (ME), book-to-market equity (BE/ME) together with system risk measured by beta can explain the stock return sufficiently and accurately. Lewellen (2014) combines many firm characteristics to predict the cross-sectional return derived from Fama-MacBeth regressions. In the sample of 'All stocks' and 'All-but-tiny stocks', the slopes on BE/ME is significantly positive and the slopes on size is significantly negative. The predictive ability of size and BE/ME is somewhat weaker among 'Large stocks'.

For the firm size, Banz (1981) firstly tests the New York Stock Exchange from 1926 to 1975 and concludes that small firms earn 0.4% averagely more than large firms. The small firm effect is supported by Levis (1985), Ho et al. (2000) and

Hodoshima et al. (2000) who study on UK, Hong Kong, and Japanese stock markets respectively. Furthermore, Stoll and Whaley (1983) and Keirn (1983) point out that the small firm effect can be ascribed to transaction cost and the January effect respectively. On the contrary, there are also some evidences against the small firm effect. For example, Roll (1981) finds that there exists a positive relationship between firm size and trading frequency searching on the US stock market, thus the small firm effect is due to less-frequent trading. Chan and Chen (1988) emphasize that the small firms earn more as a result of the imprecise measurement of beta.

The cornerstone study on book-to-market equity (BE/ME) can be traced back to Stattman (1980) who shows a positive relationship between expected stock returns and BE/ME in the US stock market. Chan et al. (1991) find that high BE/ME stocks earn 1.1% more than low BE/ME stocks in the Japanese stock market and the January effect does not exist. Fama and French (1992) also find the strong power of BE/ME to explain the stock returns in US stock market, which can absorb the role of E/P, leverage and some of the firm size. Some studies also explain the BE/ME effect. Chan and Chen (1991) firstly demonstrate that firms with poor prospect have low price and high BE/ME, meanwhile, those with poor prospect have higher expected returns than those with strong prospect. Fama and French (1995) also give the fundamental economic explanations for the BE/ME effect. However, there are still some disagreements on the BE/ME effect. Daniel and Titman (1997) state that BE/ME is not the risk factor of the firm in generating the stock returns, but the firm's risk characteristics. Lakonishok et al. (1994) contribute the BE/ME effect to the market overreaction to the firm's prospects.

With respect to liquidity, the most influential work owes to Amihud and Mendelson (1986) who test the relationship between stock returns and liquidity measured by quoted bid-ask spread during the period of 1961-1980. They find that less liquidity assets require more expected returns compared with more liquidity assets as a result of its higher transaction cost. Brennan and Subrahmanyam (1996) use an innovative method which separates the transaction cost into variable and fixed components. They find stock returns concave related with the former one but unrelated with the latter one. In addition to the measurement of quoted bid-ask spread, Datar et al. (1998) come to the same conclusion with Amihud and Mendelson (1986), however, they measure the liquidity by turnover rates (the number of shares traded divided by the number of shares outstanding in that stock).

In addition to the factors mentioned above, other variables examined in previous studies include earning-to-price ratio (E/P), dividend-to-price ratio (D/P), and cash flow-to-price ratio (C/P). For example, Basu (1977, 1983) finds a negative relationship between stock returns and E/P using data on US stock market. Rozeff (1984) and Perepeckzo (2014) provide empirical support for using

D/P to explain the expected stock returns. Lakonishok et al. (1994) find C/P is capable of explaining the stock returns in the Japanese market.

Among the related literatures on Chinese stock market, Drew *et al*. (2003) firstly find the negative relationship between stock return and firm size. However, different from most previous results, the coefficient of the BE/ME is significantly negative. They ascribe it to a number of non-trading shares held by the government and being inefficiently valued. Furthermore, they fail to find any relationship between beta and stock returns. Wang and Xu (2004) and Wong *et al.* (2006) confirm Drew's et al. (2003) conclusion about firm size, but state that BE/ME fail to have any power to explain the stock returns when investigating the Shanghai stock market. Chang et al. (2007) and Wang and Di Iorio (2007) come to the same conclusion that ME is negatively related with stock returns, however, BE/ME is positively related with stock returns. Additionally, Wang and Di Iorio (2007) confirm the invalidity of beta, E/P and D/P in explaining the stock returns. For the liquidity, Wang and Chin (2004) find that low-liquidity stocks outperform high-liquidity stocks when investigating the Chinese stock market.

The deficiencies in the previous researches on Chinese stock market include: none of them includes all of the potential explanatory factors in their tests; most of them investigate the periods before 2005 when the standards and regulatory framework of Chinese stock market was not mature; most of them include redundant variables when using the multivariate regression, which may induce the problem of multicollinearity; most of them take all the sample as a whole instead of distinguishing bear markets from bull markets or distinguishing different stock market cycles, which may also hide important messages as stock returns may response differently to the same shock during different times.

This paper investigates the relationship between stock returns and beta, liquidity, ME, BE/ME, E/P, C/P, D/P respectively on Shanghai and Shenzhen main board A-share stock markets from 1999 to 2014. Using Fama and French (1992) method, we overcome the deficiencies mentioned above and find a new pair of factors which can significantly explain the stock returns: liquidity (turnover rate) and ME. Furthermore, in the cyclical analysis of stock return, we find that liquidity is positively significant through all cycles. We also divide China's stock market into bull markets and bear markets, and find that liquidity and ln(ME) are still significant factors of stock returns in both markets. However, the effect of liquidity and ln(ME) on stock returns is almost two times larger in bull markets than in bear markets. Additionally, E/P is an important factor explaining the stock returns' going down in bear markets. Our findings imply that investors should pay closer attention to stock's turnover, firm size during bull markets than bear markets, and E/P during bear markets than bull markets.

The remainder of this paper is organized as follows: 1) Data and the methodology used in this paper are described. 2) Empirical analysis and results are reported, including the results of univariate sorting analysis,_univariate and

multivariate cross-sectional regressions of the full sample and subsamples. 3) Summary and conclusions are provided.

Data and methodology

Data

Our test covers the period from January 1999 to December 2014. The sample starts from 1999 because China's A-share stock market was still at initial stage in the early 1990s[6]. The explained factor is monthly stock returns. The explanatory factors include beta, market equity (ME), book-to-market equity (BE/ME), liquidity, earning-to-price ratio (E/P), dividend-to-price ratio (D/P), and cash flow-to-price ratio (C/P). To be specific:

1. Monthly stock return is defined as: $(P_t - P_{t-1}) / P_{t-1}, t = 1,2,3,....,192$;

2. Beta of an individual stock is estimated by regressing individual stock returns against Shanghai Composite index, covering the past two years;

3. Market equity is defined as the natural logarithm of the market value of equity;

4. Book-to-market equity is calculated by the firm's book equity (stockholder's equity) during the past fiscal year divided by its market equity mentioned above; BE/ME is transformed into natural logarithm;

5. Liquidity is defined as the monthly turnover ratio (TR) calculated as the number of shares traded in a month divided by the number of shares outstanding;

6. Earning-to-price ratio is the annual earning of the firm during the past fiscal year divided by its monthly stock price;

7. Dividend-to-price ratio is the annual dividend of the firm during the past fiscal year divided by its monthly stock price;

8. Cash flow-to-price ratio is the annual cash flow of the firm during the past fiscal year divided by its monthly stock price.

To form the explained and explanatory factors above, monthly closing price, annual volume of total shares, annual book equity (stockholder's equity), annual earning, annual dividend, annual cash flow, and liquidity measured by monthly turnover rate of all the main board A-shares listed on the Shanghai Stock Exchange and the Shenzhen Stock Exchange are obtained from the database of Wind Information Co., Ltd (Wind Info).

[6] Shanghai Stock Exchange and Shenzhen Stock Exchange were founded in 1990. In the first few years, stocks issued in these two exchange were available to a certain shareholders, mainly domestic investors.

Among all of the stocks available, the special treated ones named with "*ST", "S*ST", "S", "ST" and "SST" are eliminated because there are some problems with their financial condition. Furthermore, the stocks with negative BE/ME are also excluded. Finally, consistent with Fama and French (1992), we exclude the financial firms in the samples because of their high leverage ratio. In order to carry on cyclical analysis of stock returns in China's stock market, we need to select indicators to reflect the degree of prosperity of stock market which is usually represented by broad index (Pagan & Sossounov, 2003). Shanghai Composite Index and Shenzhen Composite Index are two important indexes in China's stock market. Their behavior to a large degree reflects the up and downs of stocks' market prices in China. As these two indexes are strongly correlated with each other and Shanghai Composite Index has longer periods of data[7], we only choose Shanghai Composite Index as the indicator for cyclical analysis.

Methodology

There are three methodologies to be used in our test. One is univariate sorting test, one is univariate and multivariate cross-sectional regressions, and the other is BB (Bry and Boschan) algorithm.

For the univariate sorting methodology, we firstly test the relationship between single factor and stock returns in order to find the significant factor(s). Furthermore, we test the interaction between or among the significant factors. Finally, we find the most significant factor(s) affecting the stock returns. To be specific, at the beginning of each year, all of the stocks which meet our requirement above are classified into ten portfolios from low to high according to their beta, market equity, book-to-market equity, liquidity, positive E/P, C/P and D/P respectively. To be noted, the stocks are classified based on deciles of the factor's value. To test the influence of negative E/P, C/P and zero D/P on the stocks returns independently, three additional portfolios are formed, which contain the stocks with negative E/P, C/P and zero D/P respectively. Therefore, there are eleven portfolios for the E/P, C/P and D/P respectively. At the beginning of each year, all stocks are reclassified into new portfolios including new stocks which meet our requirement. All of the new portfolios will be held for the next year. For each year, we average all the stocks' monthly returns, and calculate the equal-weighted mean of the average monthly returns of all the stocks in every portfolio. The same method is also applied to the explanatory factors. Finally, we find the relationship between stock returns and all the explanatory factors respectively.

In addition to univariate sorting method, we also apply univariate and multivariate cross-sectional regressions to test the relationship between stock returns

[7] Wang and Di Iorio (2007) find that the two indices are highly correlated (0.86) during the sample period, and according to the first order autocorrelation test, only 43 of 1145 individual stocks in the original sample have statistical significance at the 5% level.

and the above factors statistically. To be specific, the stock returns are firstly regressed on each factor in cross-section, and then the monthly coefficients and t-statistics are averaged. Besides, to test the relationship between negative E/P, C/P, zero D/P and the stocks returns independently, three dummy variables for negative E/P, C/P, and zero D/P are constructed. The average monthly t-statistic can distinguish the significant explanatory factors. None of the previous researcher has ever explained the rational of using average of the monthly coefficient and t-statistic. The key point is that the monthly coefficient and t-statistic are positive or negative alternatively at different times. The positive (negative) t-statistic stands for positive (negative) relationship between stock returns and factors. If the average of the monthly t-statistic exceeds the value of statistical significance at the 10 percent level, it means that the factor can significantly explain the stock returns, meanwhile, it also means that the number of stocks with positive (negative) coefficient is extremely larger than that with opposite coefficient and the relationship between stock returns and factor is mainly positive (negative). Similar with the univariate sorting method, the stock returns is regressed on the factors significant in the univariate regression, which can help us find the intrinsic influence of each factor on the stock returns when controlling the other factors. Different from Fama and French (1992), not all of the factors are included in the same regression because the insignificant factors may affect the explanatory power of the significant factors. To be specific, the monthly cross-sectional regressions as below are estimated:

$$R_i = \alpha_0 + \gamma_1 \beta_i + \varepsilon_i \tag{1}$$

$$R_i = \alpha_0 + \gamma_2 TR_i + \varepsilon_i \tag{2}$$

$$R_i = \alpha_0 + \gamma_3 \ln ME_i + \varepsilon_i \tag{3}$$

$$R_i = \alpha_0 + \gamma_4 \ln(BE / ME)_i + \varepsilon_i \tag{4}$$

$$R_i = \alpha_0 + \gamma_5 EP(+)_i + \gamma_6 EPdummy_i + \varepsilon_i \tag{5}$$

$$R_i = \alpha_0 + \gamma_7 CP(+)_i + \gamma_8 CPdummy_i + \varepsilon_i \tag{6}$$

$$R_i = \alpha_0 + \gamma_9 DP(+)_i + \gamma_{10} DPdummy_i + \varepsilon_i \tag{7}$$

If there are more than two factors significant in the regressions above such as TR and ln(ME), the regression below must be estimated as well.

$$R_i = \alpha_0 + \gamma_2 TR_i + \gamma_3 \ln(ME)_i + \varepsilon_i \tag{8}$$

In the regression above, $i = 1, 2, 3, \ldots, N$, where N is the number of stocks which meet our requirement mentioned above each month.

We carry on all the regressions not only for the full sample period, but also for sub-samples include: each stock cycles, all the bear markets and all the bull markets. In the periods of bull market, market prices generally goes up while in

the periods of bear market stock prices generally goes down (Pagan and Sossounov, 2003). The segmentation of cycles and bull and bear markets is based on BB algorithm. The algorithm was first used to identify business cycles (Bry and Boschan, 1971), and then it is successfully applied to the stock market (Pagan and Sossounov, 2003). It takes two steps to find out the cycles of stock market by using BB algorithm. First, we need to locate all the turning points in the stock market as those points may mark the different phases of a stock market cycle. Then, redundant turning points are eliminated. Not all turning points are the real peaks or troughs of a stock market cycle, which only constitute the volatile segments of a cycle, thus, some criteria on the minimal intervals for peaks (8 months), troughs (8 months) and cycles (16 months) are made to ensure period is long enough to contain a cycle[8].

The empirical analysis and results

Univariate analysis of stock returns and firm characteristics

Based on the firm characteristics - beta, liquidity, ln(ME), ln(BE/ME), E/P, D/P and C/P, the univariate sorting test is used to test the explanatory power of these independent variables mention above. The results show that except for liquidity, ln(ME) and ln(BE/ME), the rest of the factors have no significant relationship with stock returns, both in the test of each year and the average results of every year in the full sample. *Tables 1* to *3* only report the significant results of the equal-weighted average returns of portfolios on liquidity, ln(ME) and ln(BE/ME). With respect to liquidity, it shows that the returns of portfolios have a significantly upward trend with the liquidity (turnover rate) going up, except for two outliers in portfolio 5 and portfolio 10. This suggests that more frequently traded stocks are likely to generate higher returns. The variables of ln(ME) have the similar upward trend with liquidity, except for two outliers in portfolio 2, portfolio 5 and portfolio 6. For ln(BE/ME), it has the opposite trend with stock returns except for outliers which belong to portfolio 4 and portfolio 9. The number of outlier illustrates that liquidity has stronger power in explaining the stock returns than ln(BE/ME).

[8] In terms of the selection of minimal length between peaks and troughs and peaks and peaks, we refer to the literature of Bry & Boschan (1971). They have successfully identified the cycles of stock market of the United Kingdom, the United States and Australia.

Table 1. *Returns of Portfolios Formed on Liquidity (Turnover Rate)*

	1	2	3	4	5	6	7	8	9	10
1999	0.547	1.192	1.639	2.184	2.170	1.985	1.987	2.452	2.501	2.312
2000	3.796	3.791	3.868	4.357	4.453	4.558	4.837	4.829	5.174	4.540
2001	-2.351	-2.135	-2.014	-2.014	-2.074	-1.663	-1.730	-1.632	-1.000	-1.702
2002	-1.562	-1.740	-1.856	-1.474	-1.624	-1.360	-1.518	-1.561	-1.728	-2.872
2003	-1.155	-1.630	-1.355	-1.006	-1.065	-0.888	-0.977	-1.063	-1.234	-0.571
2004	-1.277	-1.258	-1.021	-1.066	-1.141	-1.282	-0.466	-0.801	-1.709	-2.225
2005	-0.992	-0.594	-0.570	-0.608	-0.849	-1.075	-0.920	-0.214	-1.042	-0.316
2006	6.714	5.640	5.708	6.029	5.683	6.121	5.817	5.624	5.832	3.945
2007	11.298	12.308	14.390	11.598	9.350	10.720	10.913	11.284	12.030	11.910
2008	-4.908	-6.446	-6.577	-6.585	-6.254	-5.957	-5.321	-5.642	-5.125	-3.746
2009	6.720	8.275	8.440	8.261	8.503	8.920	8.461	9.142	13.012	5.188
2010	0.363	0.431	0.852	1.824	1.464	1.739	2.022	2.858	1.635	-0.010
2011	-2.445	-3.039	-3.119	-2.981	-3.036	-3.184	-2.668	-2.814	-1.904	-3.351
2012	0.430	0.564	0.163	0.480	0.359	0.891	0.808	0.472	0.755	2.455
2013	-0.164	0.647	1.916	1.792	2.203	2.443	3.072	3.701	4.272	4.923
2014	3.312	3.498	3.247	3.350	3.142	3.342	3.918	4.213	4.571	15.119
Average	1.145	1.219	1.482	1.509	1.330	1.582	1.765	1.928	2.253	2.225

Table 2. Returns of Portfolios Formed on ln(ME)

	1	2	3	4	5	6	7	8	9	10
1999	2.016	2.108	1.247	0.932	1.819	1.807	2.189	1.865	1.847	3.131
2000	5.276	4.719	4.403	3.987	4.780	4.047	3.665	4.384	4.373	4.551
2001	-1.562	-1.778	-1.690	-1.723	-2.028	-2.101	-1.767	-1.907	-1.934	-1.814
2002	-1.866	-2.261	-2.326	-2.162	-1.764	-1.610	-1.711	-1.574	-1.170	-0.833
2003	-3.276	-2.154	-2.256	-1.980	-0.953	-1.098	-0.540	-0.600	0.325	1.655
2004	-1.634	-1.817	-1.865	-1.390	-1.461	-1.267	-1.038	-0.436	-0.709	-0.651
2005	-1.038	-1.217	-0.626	-0.821	-1.301	-0.514	-0.774	-0.444	-0.523	0.048
2006	3.104	3.015	4.110	4.867	5.683	5.901	6.056	6.815	7.144	8.758
2007	8.035	12.064	10.008	11.481	11.251	11.341	10.588	11.324	11.396	11.245
2008	-4.021	-5.010	-5.258	-5.411	-5.818	-5.345	-5.635	-6.114	-6.439	-6.470
2009	7.247	8.335	8.044	9.238	9.145	10.069	8.711	8.302	7.880	7.267
2010	-0.497	1.200	1.600	1.627	1.509	1.947	1.391	1.129	2.127	0.936
2011	-4.850	-2.892	-2.424	-2.692	-2.427	-2.658	-2.669	-2.733	-2.461	-2.527
2012	0.250	1.318	0.482	0.864	0.502	0.747	0.662	0.819	0.679	0.830
2013	3.189	3.307	2.624	2.402	2.248	2.465	2.152	2.291	2.034	1.223
2014	10.298	5.158	4.699	3.526	4.824	3.366	3.101	3.260	3.530	3.264
Average	1.292	1.506	1.298	1.422	1.626	1.694	1.524	1.649	1.756	1.913

Table 3. *Returns of Portfolios Formed on ln(BE/ME)*

	1	2	3	4	5	6	7	8	9	10
1999	2.356	2.238	2.862	1.028	1.665	2.336	1.536	1.360	1.448	2.274
2000	2.230	2.336	2.172	2.246	1.777	2.122	1.467	2.464	2.511	1.882
2001	1.625	1.076	-0.019	1.336	0.637	-0.137	0.595	-1.527	-0.686	-0.636
2002	0.170	0.217	0.825	0.220	0.721	-0.055	-0.868	0.103	0.044	-0.336
2003	1.513	1.190	0.578	-0.123	0.719	0.746	0.151	1.789	1.702	1.368
2004	0.769	0.920	0.222	0.789	0.807	0.307	1.009	0.623	0.332	0.372
2005	1.075	1.911	2.179	0.491	0.935	1.866	1.217	0.801	0.520	0.894
2006	5.660	5.012	4.460	3.481	3.651	3.924	3.355	2.774	1.923	2.254
2007	5.753	6.114	3.213	5.380	4.918	5.832	5.918	4.535	5.057	3.430
2008	-0.779	-1.258	-0.661	-0.772	-0.006	-1.922	-0.728	-0.538	1.205	1.164
2009	4.203	5.011	5.113	4.739	5.203	5.003	5.175	4.194	4.310	4.188
2010	2.383	2.758	2.258	1.880	2.116	1.359	1.534	0.569	0.876	-0.613
2011	0.235	-0.627	-0.124	-0.251	-0.970	-0.502	-1.077	-1.686	-2.115	-3.322
2012	1.360	0.740	0.571	0.941	0.901	0.744	0.594	0.490	0.693	0.427
2013	2.674	2.948	2.648	2.191	1.880	2.036	2.274	1.737	1.717	1.333
2014	2.806	2.503	3.114	2.926	2.789	2.851	2.515	2.432	2.405	3.105
Average	2.127	2.068	1.838	1.656	1.734	1.657	1.542	1.258	1.371	1.111

Univariate and Multivariate cross-sectional regressions

The univariate analysis results may be misleading if regressions only contain one explanatory variable, because one variable may be significant in a univariate regression instead of in a multivariate regression (Fama and French, 1992). Therefore, we not only do univariate regressions using Fama and MacBeth methodology but also re-examine the interaction between stock returns with all explanatory variables which turn out to be statistically significant in the univariate regressions. *Table 4* shows the results of univariate and multivariate cross-sectional regression within the whole period. The univariate test demonstrates that only liquidity and ln(ME) are significant in explaining the stock returns respectively with 1% significant level and 5% significant level. To investigating the interaction of variables, we include them into the multivariate regression, and find that liquidity still has strong power to explain the stock returns in model 8, which is the same with that in univariate regression. However, different from the univariate sorting analysis, ln(ME) fails to explain the stock return and its validity is absorbed by liquidity.

Table 4. *Univariate and Multivariate Cross-Sectional Regressions from 1999 to 2014*

Model	Intercept	BETA	Liquidity	ln(ME)	ln(BE/ME)	E(+)/P	E/P dummy	C(+)/P	C/P dummy	D(+)/P	D/P dummy
1)	0.169 (0.630)	1.623 (1.030)									
2)	-1.148 (-5.684)		0.063*** (8.090)								
3)	-14.616 (-2.226)			0.787** (2.388)							
4)	1.355 (2.503)				-0.643 (-1.361)						
5)	2.290 (3.573)					-24.273 (-1.363)	-1.036 (-0.831)				
6)	1.942 (2.763)							-5.708 (-0.775)	-0.365 (-0.389)		
7)	1.955 (2.951)									-7.197 (-0.481)	-0.415 (-0.504)
8)	0.190 (-0.086)		0.031*** (3.172)	0.000 (0.738)							

T-statistics are reported in brackets._, **, and *** mean statistical significance at 10%, 5%, and 1%, respectively.*

Additionally, we list the time series t-statistic of all the factors in figures below, where the vertical and lateral axis denote t-statistic and time respectively, and the two dark straight lines show the t-statistic which meets the 5% significant level. *Figure 1* shows that beta is not significant in most of the period and has a large volatility. Liquidity is positive and obviously significant for nearly the whole period which means that there is a stable and positive relationship between liquidity and stock returns. *Figure 2* shows that firm size has positive relationship with stock returns in most of the time and fluctuates around zero are very strongly. For the ln(BE/ME), the t-statistic is not significant before 2010. However, ln(BE/ME) is nearly completely negative and significant after 2010. This implies an improvement in Chinese stock market. Similarly, we fail to find any relationship between stock returns and E/P, C/P, D/P respectively from *Figure 3*.

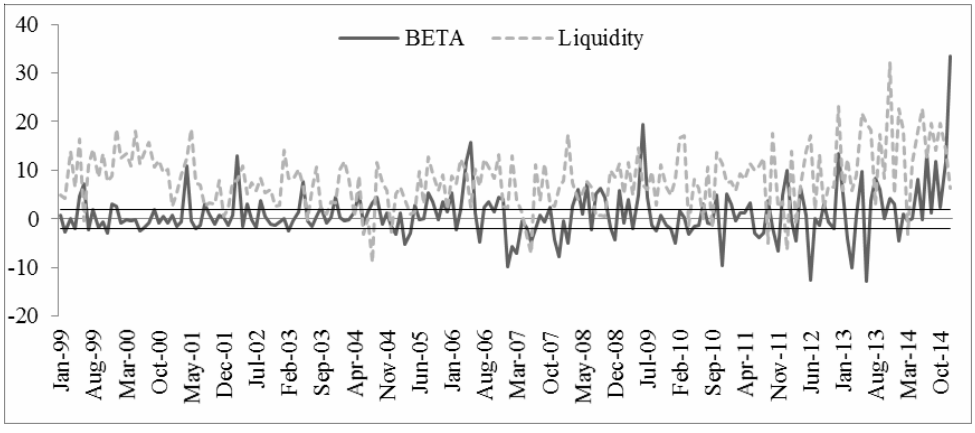

Figure 1. *Time Series T-Statistic of Beta and Liquidity on Univariate Regression*

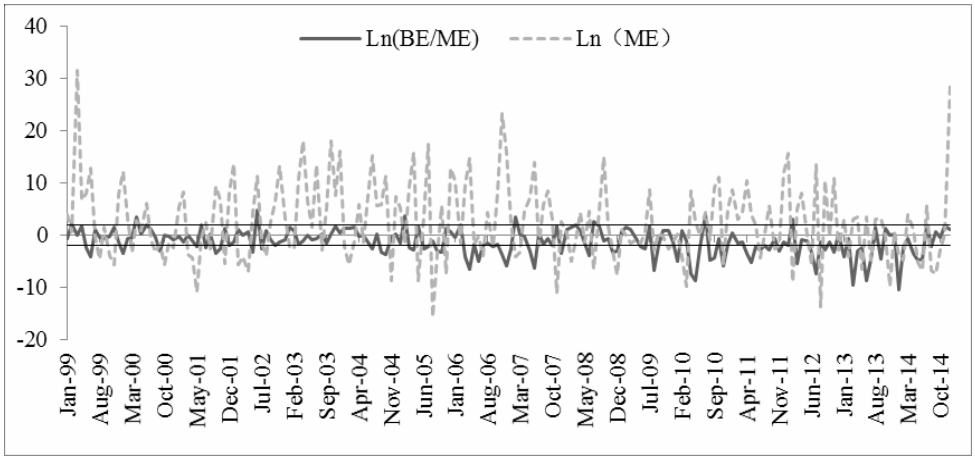

Figure 2. *Time Series T-Statistic of ln(BE/ME) and ln(ME) on Univariate Regression*

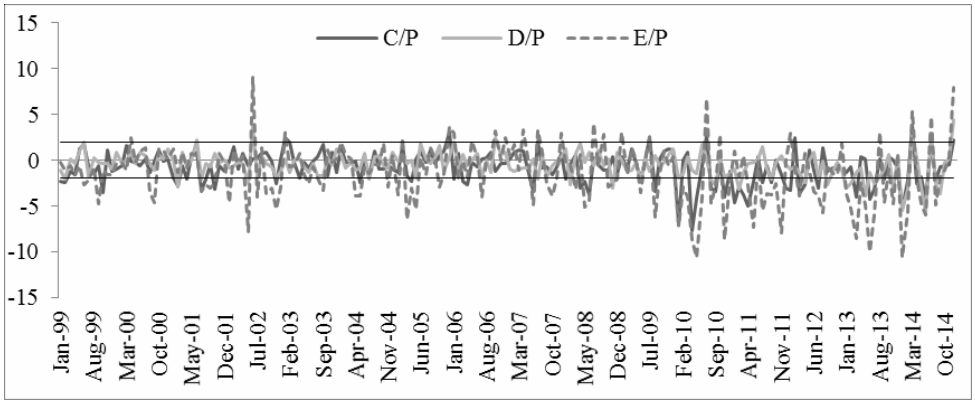

Figure 3. *Time Series T-Statistic of C/P, D/P and E/P on Univariate Regression*

Multivariate cross-sectional regressions of stock market cycles

Based on BB algorithm, three peaks marking stock market turning from bull market to bear market and two troughs marking stock market turning from bear market to bull market of stock market trend are found. According to these turning points we divided the history of China's stock market from January 1999 to December 2014 into bull market and bear market and found 2 complete cycles of stock market that China went through and a cycle which haven't finished by the end of 2014, including 3 bear markets and 3 bull market, as shown in *Table 5*.

Table 5. *Peaks and Troughs of Shanghai Composite Index (from 1999 to 2014)*

Peaks	Troughs	Stock market cycle	Bear Market	Bull Market
				1999.01~2001.02
2001.02	2005.05	2001.02~2007.10	2001.02~2005.05	2005.05~2007.10
2007.10	2008.11	2007.10~2009.12	2007.10~2008.11	2008.11~2009.12
2009.12		2009.12~--	2009.12~2014.12	

Table 6-8 presents the multivariate cross-sectional regressions for two and a half stock market cycles, with time ranges from February 2001 to October 2007, from October 2007 to December 2009 and from December 2009 to December 2014 respectively. The factors of stock returns differ from each cycle. During the stock market cycle from January 2001 to October 2007, liquidity and ln(ME) have a statistically positive relationship with the trend of stock returns in the univariate regressions. However, during the cycle of the next, from October 2007 to December 2012, the result shows a strongly positive relationship between liquidity and stock return in the univariate regressions as well as the multivariate cross-sectional regressions. In the current cycle since December 2012, we found that liquidity, ln(BE/ME) provide significant explanatory power in the univariate regressions. Interestingly, E(+)/P which shows no evidence in strong relationship with stock return in the previous two cycles becomes an significant factor to explain the changes in stock market in the current cycle.

Table 6. *Univariate and Multivariate Cross-Sectional Regressions from January 2001 to October 2007*

Model	Intercept	BETA	Liquidity	ln(ME)	ln(BE/ME)	E(+)/P	E/P dummy	C(+)/P	C/P dummy	D(+)/P	D/P dummy
1)	0.059 (0.561)	1.641 (0.824)									
2)	-0.690 (-6.337)		0.061*** (5.976)								
3)	-25.072 (-3.748)			1.293*** (3.810)							
4)	1.557 (2.937)				-0.665 (-1.066)						
5)	2.074 (2.658)					-19.406 (-0.764)	-0.773 (-0.609)				
6)	1.764 (2.180)							-3.232 (-0.292)	-0.249 (-0.199)		
7)	1.947 (2.375)									-3.345 (-0.284)	-0.370 (-0.348)
8)	0.670 (0.400)		0.031 (1.619)	0.001 (1.083)							

T-statistics are reported in brackets._, **, and *** mean statistical significance at 10%, 5%, and 1%, respectively.*

Table 7. *Univariate and Multivariate Cross-Sectional Regressions from October 2007 to December 2009*

Model	Intercept	BETA	Liquidity	ln(ME)	ln(BE/ME)	E(+)/P	E/P dummy	C(+)/P	C/P dummy	D(+)/P	D/P dummy
1)	-1.944 (0.626)	4.226 (1.381)									
2)	-2.516 (-5.870)		0.057*** (6.768)								
3)	-0.150 (0.135)			0.074 (-0.034)							
4)	1.652 (2.964)				-0.382 (-0.675)						
5)	2.532 (4.046)					-17.509 (-0.809)	-1.294 (-1.266)				
6)	2.261 (3.807)							-5.528 (-0.725)	-0.088 (-0.229)		
7)	2.381 (4.151)									-0.423 (-0.167)	-0.964 (-1.364)
8)	-0.282 (0.059)		0.029*** (2.719)	0.000 (0.447)							

T-statistics are reported in brackets._, **, and *** mean statistical significance at 10%, 5%, and 1%, respectively.*

Table 8. *Univariate and Multivariate Cross-Sectional Regressions from December 2009 to December 2014*

Model	Intercept	BETA	Liquidity	ln(ME)	ln(BE/ME)	E(+)/P	E/P dummy	C(+)/P	C/P dummy	D(+)/P	D/P dummy
1)	0.646 (0.482)	0.841 (1.505)									
2)	-1.096 (-4.340)		0.044*** (10.275)								
3)	-3.963 (-1.104)			0.234 (1.381)							
4)	0.555 (1.419)				-0.869** (-2.498)						
5)	2.220 (5.016)					-32.022** (-2.649)	-1.186 (-1.071)				
6)	1.674 (3.100)							-7.869 (-1.507)	-0.457 (-0.651)		
7)	1.638 (3.663)									-18.658 (-1.038)	-0.452 (-0.589)
8)	-0.286 (-0.886)		0.031*** (5.821)	0.000 (0.481)							

T-statistics are reported in brackets._, **, and *** mean statistical significance at 10%, 5%, and 1%, respectively.*

Multivariate cross-sectional regressions during bear and bull markets

The results of multivariate cross-sectional regressions for bear markets and bull markets are reported in *Table 9* and *Table 10* respectively. As these two tables shows, liquidity and ln(ME) are still significant factors of stock returns both in bear markets and bull markets, which is consistent with the whole sample's test.

However, the coefficients of liquidity and ln(ME) on stock returns is almost two times larger in bull markets than in bear markets, which means liquidity and size effect is stronger when stock return is going up. Additionally, E(+)/P becomes a significant factor in explaining the stock returns' going down in bear markets. This suggests that investors show interest in stocks with positive earnings in this period.

Table 9. *Univariate and Multivariate Cross-Sectional Regressions during Bear Markets*

Model	Intercept	BETA	Liquidity	ln(ME)	ln(BE/ME)	E(+)/P	E/P dummy	C(+)/P	C/P dummy	D(+)/P	D/P dummy
1)	-0.365 (0.077)	1.351 (1.122)									
2)	-2.561 (-8.306)		0.049*** (7.844)								
3)	-13.470 (-2.262)			0.620** (2.185)							
4)	0.404 (0.940)				-0.584 (-1.471)						
5)	1.476 (2.960)					-30.118* (-1.879)	-0.353 (-0.443)				
6)	1.092 (1.895)							-5.891 (-0.954)	-0.233 (-0.319)		
7)	0.837 (1.858)									-10.040 (-0.667)	0.197 (0.092)
8)	-0.292 (-0.709)		0.030*** (3.565)	0.001 (0.307)							

T-statistics are reported in brackets._, **, and *** mean statistical significance at 10%, 5%, and 1%, respectively.*

Table 10. *Univariate and Multivariate Cross-Sectional Regressions during Bull Markets*

Model	Intercept	BETA	Liquidity	ln(ME)	ln(BE/ME)	E(+)/P	E/P dummy	C(+)/P	C/P dummy	D(+)/P	D/P dummy
1)	1.250 (1.678)	2.002 (0.786)									
2)	1.347 (-0.859)		0.088*** (8.306)								
3)	-16.093 (-1.966)			1.054** (2.558)							
4)	3.043 (5.344)				-0.754 (-1.157)						
5)	3.804 (4.727)					-16.357 (-0.514)	-2.363 (-1.565)				
6)	3.549 (4.508)							-4.393 (-0.360)	-0.633 (-0.547)		
7)	3.983 (4.889)									-2.480 (-0.211)	-1.510 (-1.556)
8)	1.060 (1.097)		0.032** (2.364)	0.000 (1.512)							

T-statistics are reported in brackets._, **, and *** mean statistical significance at 10%, 5%, and 1%, respectively.*

Conclusions

According to above empirical analysis, we find no significant relationship between market average cross-sectional stock returns and beta, BE/ME, C/P, D/P separately, no matter in the univariate analysis or in the multivariate cross-sectional regressions tests, which is consistent with most of the previous researches (Wang and Di Iorio, 2007; Yang *et al.*, 2012). To be noted, we find a new firm-specific characteristic liquidity measured by turnover rate which can explain the stock returns to the greatest extent. Although BE/ME is unable to capture the cross-sectional variation in average monthly stock returns, which is not in line with previous researches (Yang *et al.*, 2013), size factor is conditionally and positively related with stock returns. When it is used exclusively in the test, it has enough power to explain the stock returns. However, when combined with liquidity together, its significance does not exit during the period of 1999 to 2014.

If we see the influencing factors of stock returns in each stock market cycle, we find that liquidity is the most positively significant through all cycles. Besides, size effect contributes to stock return during the cycle from February 2001 to October 2007 and ln(BE/ME) as well as E/P play an important role in the current cycle starting from December 2012. With respect to, beta, C/P, and D/P, we fail to find any relationship between them and stock returns.

Additionally, if the whole period of stock market is divided into bear markets and bull markets, liquidity and size effect are still significant variables to capture stock returns, but effects of liquidity and size effect on stock returns is almost two times larger in bull markets than in bear markets. E/P becomes a significant factor in explaining the stock returns' going down in bear markets.

Our results are meaningful and helpful for investors and fund managers as portfolios which implies that investors could keep a close eye on firms' size and stocks' liquidity in particular when allocating their portfolios. Moreover, investors should be more sensitive to stock's turnover, firm size during bull markets than bear markets, while be more sensitive to E/P during bear markets than bull markets.

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References

Amihud, Y., & Mendelson, H. (1986). Asset Pricing and the Bid-Ask Spread. *Journal of Financial Economics, 17*, 223-249.

Ang, A., & Chen, J. (2007). Capm over the Long Run: 1926–2001. *Journal of Empirical Finance, 14*, 1-40.

Banz, R.W. (1981). The Relationship between Return and Market Value of Common Stocks. *Journal of Financial Economics, 9*, 3-18.

Basu, S. (1977). Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis. *The Journal of Finance, 32*, 663-682.

Basu, S. (1983). The Relationship between Earnings' Yield, Market Value and Return for Nyse Common Stocks: Further Evidence. *Journal of Financial Economics, 12*, 129-156.

Black, F., Jensen, M.C., & Scholes, M. (1972), *The Capital Asset Pricing Model: Some Empirical Tests.* New York: Praeger.

Brennan, M.J., & Subrahmanyam, A. (1996), Market Microstructure and Asset Pricing: On the Compensation for Illiquidity in Stock Returns. *Journal of Financial Economics, 41*, 441-464.

Bry, G., & Boschan, C. (1971). Front Matter to Cyclical Analysis of Time Series: Selected Procedures and Computer Programs. *Cyclical Analysis of Time Series: Selected Procedures and Computer Programs.* NBEr, 13-2.

Chan, K., & Chen, N.F. (1988). An Unconditional Asset-Pricing Test and the Role of Firm Size as an Instrumental Variable for Risk. *Journal of Finance*, *43*, 309-325.

Chan, K., & Chen, N.F. (1991). Structural and Return Characteristics of Small and Large Firms. *Journal of Finance*, *46*(4), 1467-1484.

Chan, L.K., Hamao, Y., & Lakonishok, J. (1991). Fundamentals and Stock Returns in Japan. *The Journal of Finance, 46*, 1739-1764.

Chang, R., Guan, L., Chen, J., Leong Kan, K., & Anderson, H. (2007). Size, Book/Market Ratio and Risk Factor Returns: Evidence from China a-Share Market. *Managerial Finance, 33*, 574-594.

Daniel, K., & Titman, S. (1997). Evidence on the Characteristics of Cross Sectional Variation in Stock Returns. *The Journal of Finance, 52*, 1-33.

Datar, V.T., Naik, N.Y., & Radcliffe, R. (1998). Liquidity and Stock Returns: An Alternative Test. *Journal of Financial Markets, 1*, 203-219.

Drew, M.E., Naughton, T., & Veeraraghavan, M. (2003). Firm Size, Book-to-Market Equity and Security Returns: Evidence from the Shanghai Stock Exchange. *Australian Journal of Management, 28*, 119-139.

Fama, E.F., & French, K.R. (1992). The Cross-Section of Expected Stock Returns. *The Journal of Finance, 47*, 427-465.

Fama, E.F., & French, K.R. (1993). Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics, 33*, 3-56.

Fama, E.F., & French, K.R. (1995). Size and Book-to-Market Factors in Earnings and Returns. *The Journal of Finance, 50*, 131-155.

Fama, E.F., & Macbeth, J.D. (1973). Risk, Return, and Equilibrium: Empirical Tests. *The Journal of Political Economy*, *81*(3), 607-636.

Ho, Y.W., Strange, R., & Piesse, J. (2000). Capm Anomalies and the Pricing of Equity: Evidence from the Hong Kong Market. *Applied Economics, 32*, 1629-1636.

Hodoshima, J., Garza–Gómez, X., & Kunimura, M. (2000). Cross-Sectional Regression Analysis of Return and Beta in Japan. *Journal of Economics and Business, 52*, 515-533.

Keirn, D.B. (1983). Size Related Anomalies and Stock Return Seasonality. *Journal of Financial Economics, 12*, 13-32.

Lakonishok, J., Shleifer, A., & Vishny, R.W. (1994). Contrarian Investment, Extrapolation and Risk. *The Journal of Finance, 49*, 1541-1578.

Levis, M. (1985). Are Small Firms Big Performers. *The Investment Analyst, 76*, 21-27.

Lewellen, J. (2014). The Cross Section of Expected Stock Returns, *Forthcoming in Critical Finance Review*.

Lintner, J. (1965). The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. *The Review of Economics and Statistics*, *47*(1), 13-37.

Pagan, A.R., & Sossounov, K.A. (2003). A Simple Framework for Analysing Bull and Bear Markets. *Journal of Applied Econometrics, 18*, 23-46.

Perepeckzo, A. (2014). Shareholders' Preferences, Business Cycles and Market Reactions to Dividened Announcements in Public Companies - Empirical Evidence. *Transformations in Business, & Economics*, *13*, (32B), 648-660.

Pettengill, G.N., Sundaram, S., & Mathur, I. (1995). The Conditional Relation between Beta and Returns. *Journal of Financial and Quantitative Analysis, 30*, 101-116.

Roll, R. (1977). A Critique of the Asset Pricing Theory's Tests Part I: On Past and Potential Testability of the Theory. *Journal of Financial Economics, 4*, 129-176.

Roll, R. (1981). A Possible Explanation of the Small Firm Effect. *The Journal of Finance, 36*, 879-888.

Ross, S. (1973). *Return, Risk and Arbitrage*. Canmbrigde: Ballinger.

Ross, S.A. (1976). The Arbitrage Theory of Capital Asset Pricing. *Journal of Economic Theory, 13*, 341-360.

Rozeff, M.S. (1984). Dividend Yields Are Equity Risk Premiums. *Journal of Portfolio Management*, *11*, 68-75.

Sharpe, W.F. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. *The Journal of Finance, 19*, 425-442.

Stattman, D. (1980). Book Values and Stock Returns, *The Chicago MBA: A Journal of Selected Papers, 4*, 25-45.

Stoll, H.R., & Whaley, R.E. (1983). Transaction Costs and the Small Firm Effect. *Journal of Financial Economics, 12*, 57-79.

Wang, C., & Chin, S. (2004). Profitability of Return and Volume-Based Investment Strategies in China's Stock Market. *Pacific-Basin Finance Journal, 12*, 541-564.

Wang, F., & Xu, Y. (2004). What Determines Chinese Stock Returns?. *Financial Analysts Journal, 60*, 65-77.

Wang, Y., & Di Iorio, A. (2007). The Cross Section of Expected Stock Returns in the Chinese a-Share Market. *Global Finance Journal, 17*, 335-349.

Wong, K.A., Tan, R.S.K., & Liu, W. (2006). The Cross-Section of Stock Returns on the Shanghai Stock Exchange. *Review of Quantitative Finance and Accounting, 26*, 23-39.

Yang, H., Wang, C., & Li, S. (2013). Do IPO Portfolios Improve the Investment Opportunity Set. *Evidence from Chinese A-Share Market. J Stock Forex Trade*, *2*, 106.

Yang, H., Wang, C., & Zhao, Y. (2012). The Cross-Section of Expected Stock Returns: Evidence from Chinese A-Share Market, *Business Intelligence and Financial Enginerring (BIFE).* 2012 Fifith International Conference on IEEE, 303-307.