A Work project presented as part of the requirements for the Award of a Double Degree in Management from the NOVA – School of Business and Economics, and in Finance from the EBS – EBS Universität für Wirtschaft und Recht.

An Empirical study on the Chinese A-share: Value Stocks vs. Growth Stocks

Ding Junxiao

24422

A Project carried out on the Master in Double Degree Program, under the supervision of Prof. Martijn Boons from the NOVA School of Business and Economics as well as Prof. Sandra Paterlini and Philipp Kremer from the EBS Universität für Wirtschaft und Recht.

03/1/2017

An Empirical study on the Chinese A-share: Value Stocks vs. Growth Stocks

Abstract

This paper compares the performance of value and growth strategy in the Chinese A-share markets in the post-reform period. The cumulative performance of annually rebalanced value and growth portfolio sorted by book-to-value ratio indicate that value strategy outperforms growth strategy over the time frame from January 2007 to October 2017. One can also observe a weak average value premium of 0.44% to 0.45% per month. However, the rolling window analysis indicates that the value premium in the A-share market is not robust over different time frames and investment horizons. As the time frame and investment duration vary, value strategy fails to outperform consistently. There no strong evidence to support a robust short-term or long-run advantage of value strategy. The weak and inconsistent value effect could be a result of the short horizon of the sample as there are only 129 months totally in the post-reform period. More importantly, the very strong speculative sentiment in the A-share markets is likely to be the cause for the weak value premium. Besides, another value metric, EBIT/Enterprise value, is compared with the book-to-market ratio. The results show that value portfolio sorted by book-to-market ratio has better performance than value portfolio sorted by EBIT/Enterprise value ratio.

Keywords: Chinese stock Market, A-share, Value premium, Factor trading strategy

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

B/M	Book-to-Market
CAS	Chinese Accounting Standards
CSRC	China Securities Regulatory Commission
EBIT/EV	EBIT/Enterprise Value
IFRS	International Financial Reporting Standards
SSE	Shanghai Stock Exchange
SOE	State-Owned Enterprises
SZE	Shenzhen Stock Exchange
PB	Price-to-Book
QFII	Qualified Foreign Institutional Investors

1. Introduction

As the second largest economy in the world, China plays an increasingly important role in the global financial market. The rapid development of Chinese corporations and the phenomenal growth of the stock market has also drawn substantial attention of domestic and foreign investors in recent years. Since the establishment of Shanghai stock exchange(hereinafter: SSE) and Shenzhen stock exchange(hereinafter: SZE) in the 1990s, the market capitalization of China's stock market has skyrocketed since 2003. According to Iskyan (2016), as of 2016, China has surpassed Japan and Europe, thus took the second place in world's largest stock market for a total market capitalization of US $6.6 trillion. That is a 1479 % increase in terms of total market capitalization since 2003. Compared to that of the U.S. counterpart, the total market capitalization has only grown 87% in 13 years. The number of traded stocks increase rapidly from 13 in 1991 to 3491 in October 2017. The Chinese RMB was also included as the fifth currency in Special Drawing Rights basket in 2016, which signals further integration of the Chinese financial system into the global market. The ups and downs of the domestic Chinese shares, mainly A-share, could lead to stock price fluctuations worldwide. In January 2016, the Chinese stock market dropped 18% within two weeks. It soon triggered a turbulence globally. The Dow Jones Industrial Average fell 8.2%. The DAX dropped below 10,000 in the same week.

Nevertheless, despite China's prominent presence in the world financial market, the domestic stock market has long been criticized for being underregulated and very speculative. Like many emerging markets, the Chinese stock market is exposed to a series of problems such as strong government intervention, questionable accounting practice as well as underdeveloped security regulations. Moreover, given a large number of individual investors who are prone to profit from short-term capital gains, the Chinese market is extremely volatile and unpredictable. It is reported

that Chinese retail investors trade stocks almost four times more frequently than U.S. investors (G. Chen et al. 2007).

In Berkshire Hathaway's 2017 annual meeting, a Chinese value investor asked Warren Buffet's opinion about the prospect of value investing in China. Buffet answered that value strategy would work as well in China eventually, despite the prevalence of the speculative trading. He added:

> When speculation gets rampant and when you're getting what I guess Charlie (Munger) would call "social proof" that it's worked recently, people can get very excited about speculating in markets. And, we will have it from time-to-time in the market….Markets have a casino characteristic that has a lot of appeal to people, particularly when they see people getting rich around them…. And those who haven't been through cycles before are probably a little more prone to speculate than people who have experienced the outcome of wild speculations.…but it's a dumb idea. And to the extent that you're working on it, why you're on the side of angels.

Furthermore, literature about asset-pricing model and factor investing in Chinese A-share has been growing rapidly. Particularly, the Fama and French's (1993) three-factor model has been empirically tested by many studies in the Chinese stock market. The existing literature shows that there exists a very strong size premium but results of the value premium are somehow divided. A recent research reconciles the finding of existing factor studies on Chinese A-share. They also carry out their own factor research and scrutinize 7 major factors in A-share from 1995 to 2016. The result suggests a strong value effect over the full sample but weakened value effect from 2008 to 2016 (Hsu et al. 2017). Considering the promising prospect of value investing by Warren Buffet, as well as the significant value effect on the A-share market in the past literature, it would be

interesting to have a comprehensive view at how value strategy perform in the Chinese A-share market historically compared to the growth strategy.

The reason I choose January 2007 as the starting date of the sample is that China's financial system has been going through fundamental structural changes prior to 2007. 2007 represents the milestone of major transformations in the Chinese financial industry. The Chinese regulatory body, China Securities Regulatory Commission (hereinafter: CSRC), People's Bank of China (the central bank), along with the ministry of finance had initiated several policy and regulation reforms from 2002 to 2006, in order to develop a more efficient and liberal financial market as well as a more compliant and transparent corporate governance. The most prominent and influential changes are the split-share structure reform and the Chinese Accounting Standards (hereinafter: CAS) reform.

The split-share structure[1] reform was implemented since 2005. In order to transfer all the non-tradable shares into tradable ones, most of the listed companies carried out the reforms with a compensation plan. It requires the non-tradable shareholders to compensate the tradable shareholder, for the reason that, the reform benefits the non-tradable shareholders unilaterally. The value of previously non-tradable shares has increased after they are granted the option to be freely traded on the secondary market. Before the reform, the split-structure had been frequently criticized as constitutional barriers against the efficiency of the stock market. Li & Zhang (2011, 1061) states in their research, "it became an increasingly huge encumbrance upon further development of the Chinese stock market owing to its structural flaws. It substantially distorted the pricing mechanism in the stock market and added uncertainty to investors' expectations…. As a result, prices and

[1] The split-share structure separate A-shares into mainly two classes: tradable and non-tradable. Before the reform, two thirds of the outstanding A-shares were non-tradable shares, which belonged to the state, government entities and state-controlled financial institutions. It was established initially to ensure the central government control of state-owned enterprises (hereinafter: SOE). .

investor behavior did not reflect fundamental values of listed firms." The split-structure reform had a huge impact on the market. By the end of 2006, the majority of the listed firms including all the SOEs had gone through the reform. Li and Zhang observe that after the reform, not only the value of Shanghai stock composite index had increased substantially but also they find evidence of the weak-form efficiency of both Shanghai and Shenzhen stock market. Both markets were tested to be inefficient prior to the reform.

Another important change is the convergence of the CAS towards International Financial Reporting Standards(hereinafter: IFRS).The previous CAS were inconsistent across different industries and were highly rule-based, which made it extremely difficult to rely on and compare between different companies. In Feb 2006, the Ministry of Finance introduced 39 new CAS, which to a great extent, are in line with IFRS. All public listed companies in China are required to follow the new accounting standards from January 2007. Though not fully complying IFRS, the new CAS were permitted by European Commission in December 2008 for Chinese issuers in the European market up to three years. It has not only regulated and standardized the accounting practice of Chinese public companies but also been a remarkable milestone for the application of fundamental-based trading strategy in China. Hence, It will be more representative of present market condition to choose the post-reform sample after 2007, due to the major accounting and security regulation changes mentioned above. Moreover, by excluding the samples before the reform, the fundamental ratios such as book-to-value and EV/EBIT are more consistent across time and comparable among different companies.

Unlike the developed markets, technical trading and other short-term trading strategies still play a crucial role in deciding the prices of the Chinese A-share. However, with the effective regulatory changes and increasingly efficient market, I believe there should be a lot more potential

for fundamental based long-term trading strategy in the future. Even though the speculative retail investors still account for 90% of the A-share market. There's a rapid growth of the institutional investors in recent years. Sun, Zheng, and Dong (2015, 106) claim that, in 2003, the private equity fund was supervised and recognized as institutional investors by CSRC. "The market value of their (institutional) shareholdings has boosted, from five funds of CNY4 billion (less than 1 percent of the whole market value in 1998) to 10 percent at a valuation of CNY2.25 trillion now." Besides, according to official data from Shanghai Stock Exchange, the quota of the QFII program rose up to $93.99 billion as of August 30, 2017, which had tripled its amount since its first expansion in 2007. The owners of QFII accounts are primarily foreign institutional investors who focus on long-term gains rather than short-term speculation. The increase of domestic and foreign institutional investors will greatly promote the diversity of the investment structure, therefore contributing to the market efficiency and mitigating the "casino characteristic" of the Chinese stock market. Moreover, under President Xi's administration, the anti-corruption campaign has been effectively increasing the corporate transparency and reducing accounting fraud and governmental control of listed companies including SOEs. Enforcement measures have been taken by CSRC to sanction auditors and auditing firms who fail to detect accounting fraud. In October 2013, a new policy was issued to prohibit government and party officials who are in the office from assuming directors of public listed companies. Retired officials must obtain authorities' approval to work for listed companies and are banned to receive any payments from the companies. As a result, a number of government officials were forced to resign from their independent director positions. Hope, Yue, and Zhong (2017a, 2017b) study the effect of the policy on the transparency level and accounting quality of listed Chinese firms. They find that the financial transparency and accounting quality of firms with politically-connected directors increase after the enforcement of the policy.

This thesis focus on the performance of value strategy in the Chinese A-share market in the post-reform period from 2007 to 2017. It highlights the difference between the growth and value strategy. Based on the past factor studies on Chinese A-share, my study contributes to the existing literature in three aspects. Firstly, most factor studies about A-share market include the prior-reform sample. My study focuses on the post-reform sample, which is more consistent and applicable to the current market condition. I also further extend the sample to October 2017, compared to the latest study by Hsu et al. (2017), who studies the post-reform sample from 2008 to 2016. Secondly, I retrieve all the data from Bloomberg which is an alternative source, while most of past studies on Chinese A-share chose, the China Stock Market and Accounting Research (hereinafter: CSMAR) database, which is developed by a government-backed data company. Thirdly, I further compare the traditional value metric, book-to-market (hereinafter: B/M) ratio with another metric introduced by the magic formula, the EBIT/EV ratio, to see which metric yields the higher return.

The remaining of the paper is constructed as follows. Section 2 outlines the background of the Chinese A-share market and its key characteristics. Section 3 summarizes the existing literature of factor studies in the A-share market. Section 4 describes the data and the empirical methodology. Section 5 reports the empirical results. Section 6 concludes by summarizing the main findings.

2. Overview of the Chinese stock market

One critical challenge for scholars who study Chinese stock is that the PRC has a much shorter stock history compared with most of the developed markets. It was in 1984 that a company in Shanghai first publicly listed its shares in the PRC history. Apart from short historical samples, the poor legal infrastructure established in the 1990s and the piecemeal development of the regulatory framework result in a number of problems, such as accounting frauds, market manipulation, insider trading, frequent regulatory changes, strong government intervention as well as ambiguous shareholder rights. Additionally, as mentioned in the previous section, the reporting standards of companies before 2007 differ greatly from that of the post-reform ones. As a result, for studies who examine the full sample of Chinese A-share, the fundamental-based factors are inconsistent across the years and there is a limited number of listed stocks before 2000. All these problems give rise to the difficulty of factor study and undermine the significance level of the research.

There is a list of noteworthy features that distinguish the Chinese stock market from the developed ones. They serve as essential grounds for explaining the difference of factor studies in China from the developed markets.

Firstly, the Chinese stocks are structured in a more complex manner. It is segmented into three major categories: A-share, B-share, and H-share. A-share is renminbi-denominated shares which are listed in Mainland China. It is a class created initially for domestic investors and accounts for the majority of the market capitalization of all stocks listed in China. After the Qualified Foreign

Institutional Investors[2] (hereinafter: QFII) program was launched in 2002, it also becomes available for foreigners. B shares are U.S. or Hong Kong dollar-denominated shares. They are launched exclusively for foreigners or Chinese citizens with legal foreign currency account. But it represents only a small portion of the total market and is gradually phasing out due to the QFII program. H shares are stocks listed offshore in Hong Kong by a Chinese company for foreign investors. Similar shares classes are N-share and S-share which are listed in New York and Singapore respectively.

Secondly, even though the non-tradable shares, which are previously held by the government, has become tradable after the spit-structure reform, the government still holds a great amount of the ownership in the majority of the market capitalization. It not only reduces the amount of publicly investable securities but also strengthens the government's role in corporate management. The split-share structure didn't have a big impact upon the large-cap SOEs as the majority of the stocks are still held by the government and not traded in the market which makes the many large-cap stocks illiquid and less volatile to changes of market condition.

Thirdly, CSRC frequently steps in and set trading rules to actively intervene the stock market. For example, in October 2015, a temporary short-selling ban was issued to stabilize the market. Other measures taken by CSRC includes forbidding large shareholders to sell their stocks in certain period time, adjusting transaction costs and etc.

Fourth, a great number of listed companies, especially SOEs suspend the trading in the exchange for a long period of time. For example, Xiamen Overseas Chinese Electronic Co suspended their trading for 8 months in January 2015 because of their restructuring process. It

[2] the Qualified Foreign Institutional Investors(hereinafter: QFII) was launched in November 2002 to allow foreign investors to purchase A-share. But not all stocks are available for QFII and the number of stocks allowed for QFII is limited.

suspended the trading again from August 2017 for the same reason. Shenzhen Special Economic Zone Real Estate & Properties Group Co Ltd halted the stock trading for almost one year in order to complete restructuring of important assets. These frequent trading suspensions hinder the liquidity of the stocks and give rises to the uncertainty of A-share market. There are mainly three reasons for the suspensions: (a) companies, particularly SOEs, suspend their trading in order to privately undergo projects or consolidation without disclosing to the public; (b) companies try to prevent further crash when its stock price plunges and the market is volatile. It is reported that in the 2015 stock meltdown, over half of the listed companies in both exchanges stopped trading. MSCI even set a 12-month removal rule exclusively to Chinese companies, in order to remove a number of long-suspended stocks from the index (Shen and Ruwitch 2017); (c) companies that are under financial distress and are designated with a "special treatment" status for 2 years are required to halt trading for one year and delisted in the third year if the company continue suffers losses. But the mechanism is rarely enforced. Ren (2017) reported that "Only 2 percent of mainland-listed companies reporting three consecutive years of losses have been delisted since Beijing established the stock market in 1990, compared with 5 to 6 percent in developed markets."

Fifth, almost 90% of the investor base in China are retail investors, who tend to speculate on short-term gains. Therefore, the market is very volatile and more likely to have behavioral biases. SSE and SZE even set 10% daily limit-up and limit-down mechanism of all listed stocks to curb the volatility.

Sixth, the majority of the companies listed in the SSE and SZE either don't pay or pay a very little amount of dividends. Returns of A-shares are mainly realized by capital gains rather than dividends. This might relate to the taxation on A-share investment. The capital gains of A-shares are not taxed but the dividends are. But it's very likely that the Chinese companies will start issue

more and more dividends in the coming years, as reported by Bloomberg, the Chinese government has already been carrying out measures to encourage companies to pay more dividends in order to promote long-term holding (Horta E Costa 2017).

Lastly, short selling and marginal trading are not possible in China till 2010 and they were tested in a small scope at the very beginning. Though the ban was further lifted at the end of 2011, both practices are tightly constrained and limited to only 190 stocks and 7 exchange-traded funds. Chang, Luo, & Ren (2014) studied the impact of short selling and margin trading on the Chinese stock market after 2011. They find that intensified short-selling activities are associated with improved price efficiency and low return volatility.

All in all, despite deficiencies in the current Chinese A-share market, there's noticeable trend of regulatory efforts towards a more efficient market. It is also expected to observe increasingly diversified investor structures and behaviors as well as more transparent corporate management in the near future.

3. Literature review

Eugene Fama and Ken French (1998) publish the article titled “Value Versus Growth: The International Evidence”, in which the two scholars examine 13 major developed markets around the world from 1975 to 1995. They find value stocks outperform growth stocks in 12 of the major markets but not China, as China just started the development of its stock market at the time when the article was published. But in recent years, the literature about Fama-French models and factor investing in the Chinese A-share market is also developing rapidly. However, the existing studies show inconsistent results. As one recent research on factor study states, “the emerging literature on Chinese equity anomalies has yielded troublesome disparities, particularly with respect to the magnitude and significance of the premium to a number of widely used factors, raising questions about the robustness of these results” (Hsu et al. 2017).

Huang, and Yang (2010), in a study of all A shares listed in Shanghai and Shenzhen Exchange, find that “value premiums exist throughout the sample period of 1998 to 2008….both value and small stocks have persistent premiums over growth and big stocks.” They also come up with a metric to measure financial distress and find that there’s a low correlation between value premium and financial distress risk. Hsu et al. (2017) take almost the full historical sample of Chinese A-shares from 1995 to 2016 and compare factor strategy on Chinese A-share market to the U.S. counterpart. They observe similar results of strong value and size effect throughout the whole sample but much weaker and even negative value premium over shorter samples from 2008 to 2016. Both studies use the China Stock Market and Accounting Research Database but define value strategy differently. Huang and Yang adopt the traditional definition and construct portfolio solely based on the book-to-market ratio, while Hsu et al. also employ book-to-price ratio, the earning-to-price ratio as well as the dividend-to-price ratio. Cheung, Hoguet, and Ng (2014, 58)

study Fama and French's three-factor model on the constituents of the MSCI China A index from December 2001 to December 2013. They also find that "value, as measured by book equity over market equity, has a large and significant premium in the China A-shares market….The portfolios with the highest book-to-market ratios of each size tier do consistently have higher average returns than the portfolios with the lowest book-to-market ratios." Xie and Qu (2016) find the significant size and value premium from A-shares listed on SSE between 2005 and 2012. Besides, they also examine the three factors across four different sectors. Their result shows that the value effect appears to be significant only in the utility sector.

On the other hand, F. Wang & Xu (2004) draw a contradictory conclusion. They find that from July 1995 to June 2002, "the book-to-market variable is useless in explaining the cross-sectional difference in equity returns. They attribute the surprising results to the evasive accounting standard and speculative market condition. C. Chen, Hu, Shao, & Wang, (2015) study the size and value effect of A share from July 1997 to December 2013.They find strong size effect but statistically insignificant value premium. They believe the insignificant value effect and the lack of robustness are caused by their selection of the sample. "The previously documented value effect is not robust and is largely caused by a few extreme months before 1997." X. Chen, Kim, Yao, & Yu (2010) find weak outperformance of top book-to-market portfolio over the bottom one. "The top B/P-sorted portfolio outperforms the bottom B/P-sorted portfolio by 0.74% per month at the 10 percent level." Y. Wang and Di Iorio (2007) get similar weak value effect from January 1994 to December 2002. "On average, the return on the B/M top portfolio exceeds the return on the EWP benchmark and the B/M bottom portfolio by 0.493% and 0.861% per month respectively. "

B/M ratio is the most commonly used metric academically to separate value stocks from growth stocks quantitively. Fama and French (2011) explain the rationale of using book value on

their website forum. They believe that it wouldn't make a big difference to use any fundamentals as the numerator. Book value is the better metric as it's always positive and more stable over time. It will effectively reduce turnovers in forming value portfolio. Nevertheless, practitioners and academics are still searching for an alternative metric to further improve the performance of value portfolio. Other commonly used metrics include earning-to-market ratio, cashflow-to-market, dividend-to-market ratio. However, the problems with earning and cash flow are that they vary greatly and may have negative values, while the dividends are inappropriate to study A-share as the majority of the A-share companies don't pay dividends. Hsu et al. (2017) measure the value effect on A-share with several value factors including sale-to-market, earning-to-market, and dividend-to-market besides B/M. They find insignificant positive value premium with sale-to-market sorts and negative insignificant value premium with the earning-to-market and dividend-to-market sorts from 2008 to 2016. Another popular metric in the U.S. stock market is the EBIT/Enterprise ratio (hereinafter: EBIT/EV). It's firstly introduced by Greenblatt (2006) along with the famous "magic formula". He names the EBIT/EV ratio the "earnings yield". Gary and Carlisle (2013) systematically examine the EBIT/EV ratio on the U.S. stock market from 1964 to 2011. They find that earnings yield is the superior metric than B/M ratio in forming value portfolio. The earning yield sorted value portfolio not only has a higher return than B/M sorted value portfolio but also generate wider value spread. Their risk-adjusted analysis on both metrics also indicates that earning yield metric performs better. They believe that the EBIT/EV is better because it takes debt and preferred equity into consideration, which makes companies with different capital structures comparable. Walkshäusl and Lobe (2015) studies slightly different metric, the enterprise multiple (EBITDA/Enterprise value). They find strong evidence of EBITDA in deciding international returns. They also include 90 companies listed Shanghai, Shenzhen and Hong Kong in their sample. "The return predictability of EM(enterprise multiple) is similarly present in

developed markets and emerging markets and robust across small firms and large firms, after controlling for common benchmark variables like size, B/M value, and momentum. Furthermore, we confirm the existence of a sizeable EM value premium in international markets."

Other commonly studied factor based on Fama-French model on A-share includes size, momentum, reversal, volatility, profitability, and liquidity. Appendix 1 provides a comprehensive list of the existing literature about factor study on Chinese A share. As shown in the past literature, the Fama-French three-factor models are proven to be applicable to the Chinese market. Xu & Zhang (2014) suggests that the three-factor model explain 93% of the variation of A share return from 1996 to 2013. Xie & Qu (2016) and Xinming Chen, Song, Gao, & Qiao (2017) also confirm the good explanation of return variation while utilizing the Fama-French three factors model. Among all the factors, size turns out to be the most agreed significant factor on A-share by the academics. Even though the existing literature studies the samples of different start/end date, the majority of factor studies on A-share confirm the robustness of the size factor. Though additional factors have been examined and tested in the asset pricing model in order to improve the explanatory power, the result is not robust. In some of the past literature, profitability, liquidity, and volatility may have added explanatory power to the model, but these factors are weak predictors and not robust across the sample and time horizon. Besides, technical indicators such as momentum is also a popular subject for academic research on Chinese A-share. Given a large number of retail investor and technical traders. Many investors believe that momentum indicators might work in the Chinese market, but the result is surprising. Y. Liu & Ping (2013) find a negative correlation between momentum factor and stock returns from 2000 to 2011. Hsu et al. (2017) confirm the finding on negative 12-month momentum factor. From 2008 to 2016, the momentum strategy spread is approximately negative 8%-12% per year.

4. Research Design and Methodology

4.1 Research objective

The past literature has provided extensive researches on asset-pricing models, especially Fama-French's three-factor model, in the Chinese A-share market. Thus, the objective of this paper puts more emphasis on the performance of the value factor strategy rather than re-examining the asset-pricing models. I use the univariate sorting method based on B/M ratio to test the performance of value portfolio and growth portfolio from January 2007 to October 2017. Portfolios are further sorted based on the market capitalization to investigate the role of the size factor. Additionally, the alternative value metric, EBIT/EV, which is proven to work in the U.S. market, is also investigated to be compared with B/M ratio.

4.2.Data

Monthly stock prices, market capitalization, price-to-book (hereinafter: PB) ratios and EBIT/EV ratios are directly drawn from Bloomberg. In order to have a post-reform sample size as large as possible, I retrieved the above data from January 31, 2007, to the most recent date as of this study, which amounts to 129 months or 10.75 years.

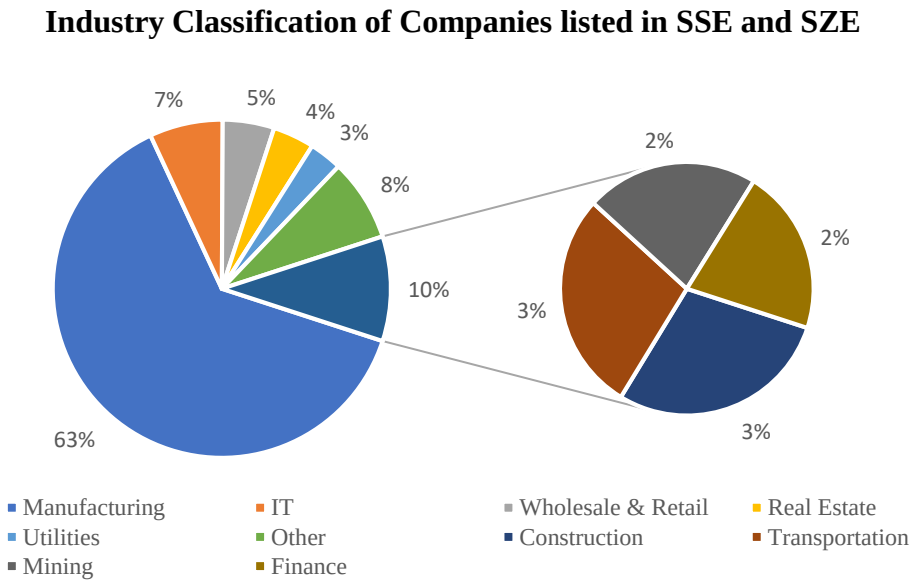
As the monthly returns of A-shares are not available in Bloomberg, the monthly returns of stocks in this thesis are calculated by simply taking the difference of last prices in two adjacent months without taking into consideration of dividends. This is because the majority of Chinese-A shares pay no or very little amount of dividends to their shareholders from 2007 to 2017. For simplicity reasons, the returns in this thesis are all represented by capital gains.

The historical PB ratios are defined by Bloomberg as the last price divided by book value per share. The book value is retrieved from the latest financial report. The EBIT/ EV is defined as Enterprise value divided by adjusted[3] trailing 12-month EBIT and the EBIT is defined as:

EBIT= Market Capitalization + Preferred equity + Minority interest + Total debt – Cash & Equivalents

All companies, which are listed in SSE and SZE as of October 2017, are selected to form portfolios. Stocks with missing market capitalization and unavailable PB or EBIT/EV ratios are removed from the investment universe. The investment universe includes companies from all industries including financial firms. Among the selected companies, manufacturing and IT companies account for the largest proportion, respectively 63% and 7% (See Figure 1). The issues related to survivorship bias is negligible in this study, as only 2% of the firms are delisted from the exchange since the 1990s (Ren 2017), and it's difficult to trace delisted Chinese companies from the database. Therefore, companies which were delisted prior October 2017 are not included in the analysis.

Figure 1. Companies listed in Shanghai and Shenzhen exchange by industry as of October 2017



Source: Shanghai stock exchange, Shenzhen stock exchange

[3] EBIT from Bloomberg are adjusted to exclude the impact of abnormal items.

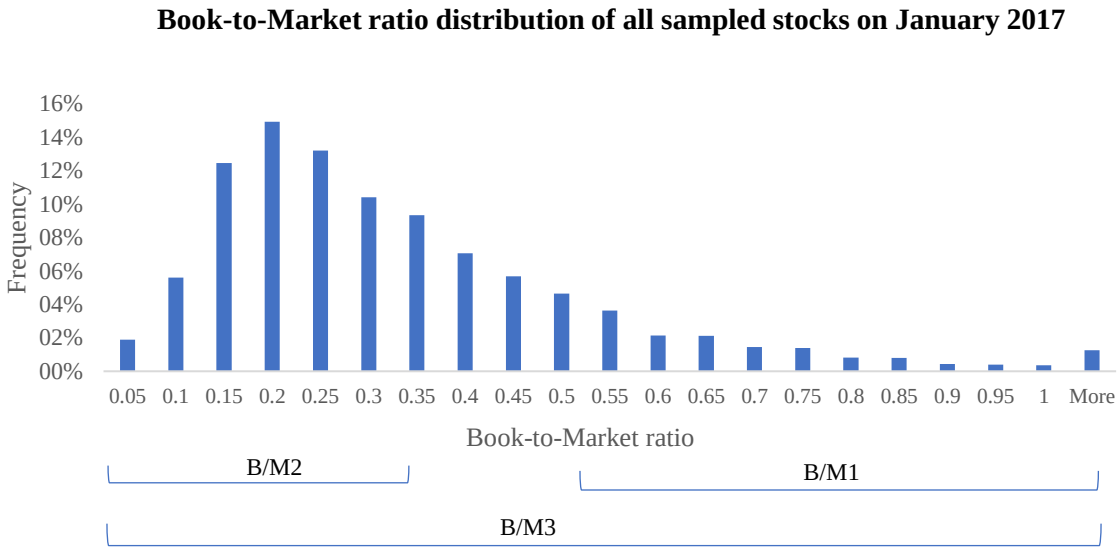
4.3.Methodology

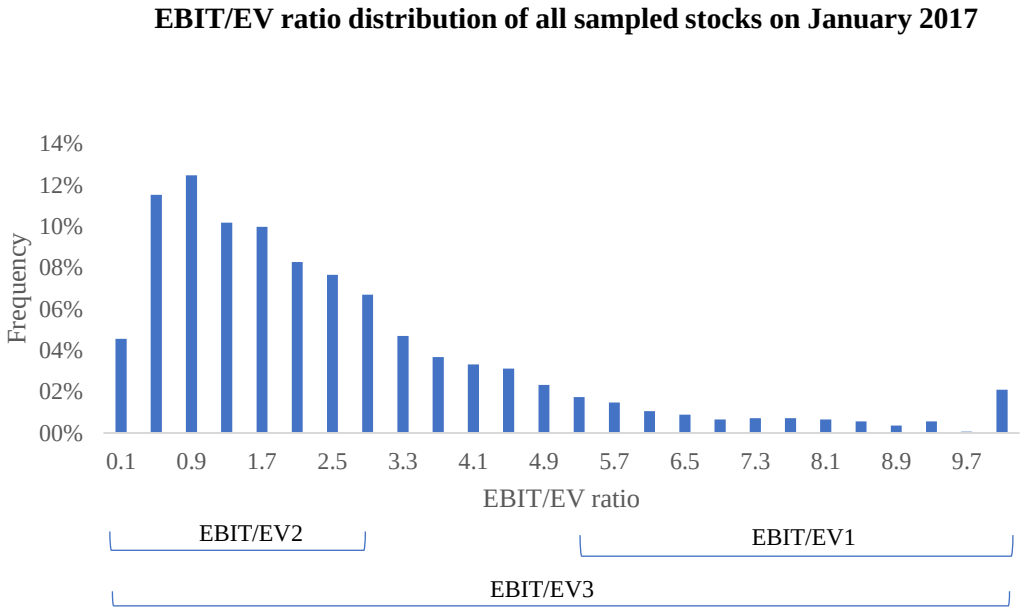
The univariate sorting method follows the literature of Fama and French's (1998) three-factor model. Book-to-market ratios of each stock are calculated as the inverse of PB ratios. Stocks are sorted annually in descending orders according to their B/M ratios as of January 31 each year. Decile portfolios are formed based on their B/M rankings and rebalanced annually. The problem of rebalancing the decile portfolio arises as the number of stocks listed in SSE and SZE has grown rapidly from 2007 to 2017. In 2007 there were only 1455 companies listed on the exchange but the number has reached 3303 in October 2017. As a result, the number of stocks which fit in the decile portfolio based on their B/M ranking in each year varies greatly. In order to address the problem, I take three methods to sort and select stocks. With the first method, I rank and extract the 1000 stocks with the highest B/M ratios each year, thus stratify the stocks based on their B/M ranking and form decile portfolios of the same size. Therefore, each portfolio comprises 100 stocks throughout the investment horizon. The value portfolio is the one composed of 100 stocks with the highest B/M ratios and the growth portfolio the opposite. Since the fiscal year usually ends in December in China, each portfolio is rebalanced annually on Jan 31 from 2008 to 2017. Stocks which don't fit in the corresponding decile at each rebalancing day will be sold and replaced with new stocks. This method ensures that each decile portfolio has the same number of stocks along the years but it makes the result susceptible to selection biases, because it excludes a number of growth stocks with the lowest B/M ratios, especially in the more recent sample. The second method follows the same process as the first one, except that I only choose the 1000 stocks with lowest B/M ratios on each rebalance date as the investment universe to form decile portfolios. As a result, an increasing number of value stocks with highest B/M ratios are excluded from forming the decile portfolios in the more recent years. The third method ranks and includes all the stocks listed on

both exchanges to form the decile portfolio. However, on each rebalance date, the decile portfolio has a different number of stocks in forming the portfolio, which might lead to biased risk-adjusted analysis across the investment horizon. I name the first method, B/M1, the second, B/M2 and the third, B/M3. The analysis built on the EBIT/EV ratio follows the same methodology as that of the B/M ratio. Similarly, EBIT/EV1, EBIT/EV2, EBIT/EV3 are called to differentiate the three methods. The decile portfolio with the highest EBIT/EV ratio is the value portfolio and the one with lowest EBIT/EV ratio is the growth portfolio.

To have a statistical overview of the sample's B/M and EBIT/EV ratio, I summarize the ratios of around 3000 A-share stocks on January 31, 2017, and their distributions are shown in Figure 2. As one can see, the distribution of both B/M and EBIT/EV ratios are positively skewed, which implies the whole market is tilting to the overvalued side. The average value of B/M ratios is around 0.31 and the average value of EBIT/EV ratios is 2.53. In other words, the market pays more than 3 times of the stocks' book value on average in the A-share market. Figure 2 also illustrates how each method selects the stocks to form decile portfolios. As the number of listed stocks increases to more than 3000 in 2017, the decile portfolios formed by B/M1 and B/M2 include totally different stocks. The drawbacks of the two methods also become more and more pronounced. The stocks included in the top B/M2 sorted portfolio is not very representative of the value strategy and the stocks included in the bottom B/M1 sorted portfolio are also not representative of the growth strategy. Therefore, in the following analysis, the B/M1 top sorted portfolio is compared with the B/M2 bottom sorted portfolio and B/M3 top sorted portfolio is compared with B/3 bottom sorted portfolio. The summary statistics of B/M ratio, EBIT/EV ratio of each method on every rebalancing date are shown in Exhibit 2.

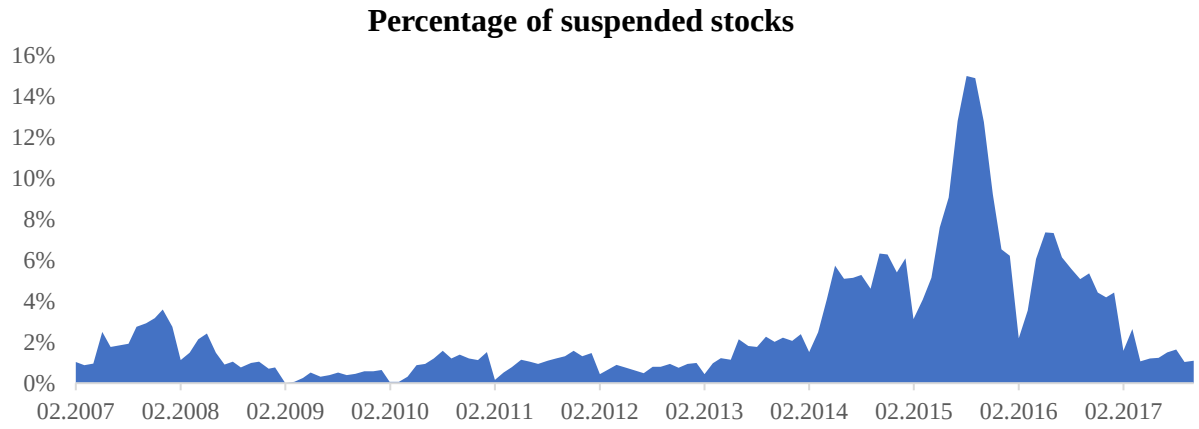
Figure 2. Histogram of book-to-market ratios and EBIT/EV ratios from all sampled stocks on January 31 2017. Companies with missing ratios are excluded.





Another major problem with the calculation of portfolio returns is that a great number of last prices are missing due to the frequent trading suspensions. Therefore, stocks that are suspended on rebalancing dates are not included in the portfolios. In addition, if certain stock is suspended in the exchange after the rebalancing date, its price during the suspension period will be regarded as unchanged and therefore have no return until it's replaced at the next rebalancing date. As shown in Figure 3, the number of suspended stocks increase sharply in the past 3 years and drop again recently. During the Chinese market meltdown in 2016, more than 200 companies suspended their listings on the exchange. The frequent and long-term suspension issues are related to the problematic suspension regulations on both exchanges. As listed companies can voluntarily halt trading, they would suspend the trading when the market get bear and volatile to prevent further price crash.

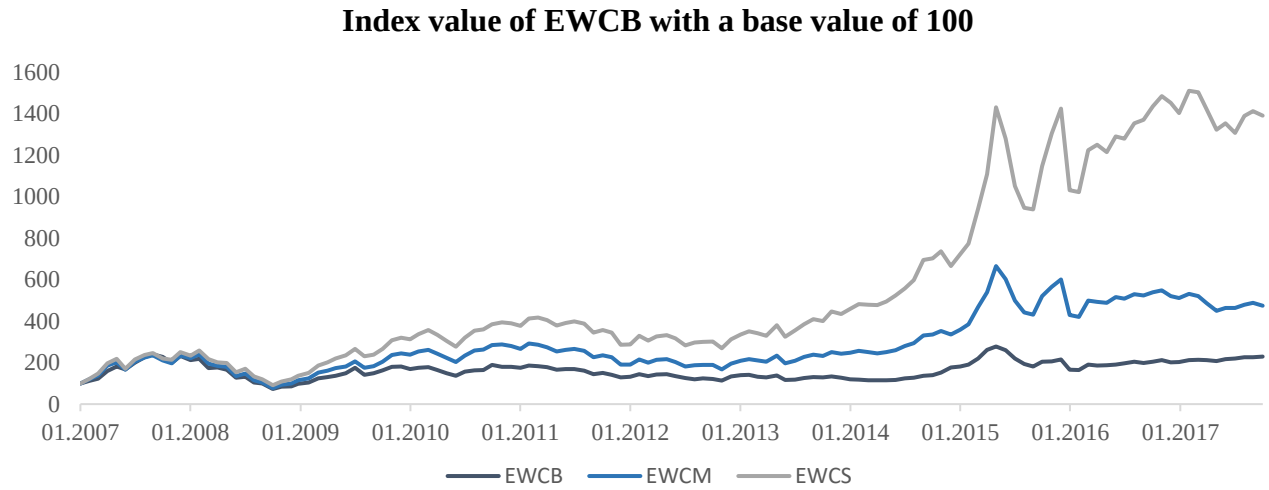
Figure 3. Percentage of suspended stocks out of all stocks listed in Shanghai and Shenzhen stock exchange



4.4.Descriptive statistics of the benchmark

The existing relevant index covering top stocks in SSE and SZE is the CSI 300. It is a capitalization-weighted stock market index of the top 300 stocks listed in both exchanges, which is a good benchmark to track the market but not that comparable to our trading strategy due to different weighting methods. In order to compare the performance of the portfolios, I construct three equally weighted indices: 1) EWCB by big-cap companies (top 30% market capitalization). 2) EWCM by mid-cap companies (middle 40% market capitalization) and 3) EWCS by small-cap companies (bottom 30% market capitalization).The indices are rebalanced on Jan 31 each year according to their market capitalization. Figure 4 shows the benchmark values as a base of 100 calculated from January 2007 to October 2017.

Figure 4. Value of EWCB, EWCS, and EWCM from January 2007 to October 2017
EWCB is composed of top 30% A share companies by market capitalization
EWCM is composed of middle 40% A share companies by market capitalization
EWCS is composed of bottom 30% A share companies by market capitalization



Two stock crashes could be clearly observed from the chart. One occurred in 2008 during the worldwide financial crisis after the Chinese stock market rapidly bubbled up in 2007. The other

one is the market meltdown from 2015 to 2016, which had a huge impact on the global financial market.

Table 1. Summary statistics of average monthly returns of EWCB, EWCM and EWCS index from February 2007 to October 2017

	EWCB	**EWCM**	**EWCS**
Mean	1.17%	1.79%	2.66%
Median	1.68%	1.89%	3.05%
Min	-27.27%	-28.33%	-27.64%
Max	30.79%	34.02%	33.85%
Standard Deviation	9.60%	10.73%	11.01%

As shown in Table 1, a strong size effect can be clearly observed in the A-share market. The result is consistent with the past literature. The average monthly return of EWCS and EWCM is respectively 2.66% and 1.79%, while the average monthly return of EWCB is only 1.17%. That is to say, the small-to-medium-cap companies in China generate much better performance than the big-cap companies each month on average from 2007 to 2017.

The very robust size factor in the Chinese stock market is not only a result of inherent higher business risk related to small-cap companies but also due to the disparities between SOEs and non-SOEs. A great number of large-cap companies in China are SOEs. Even though the split-structure has made the non-tradable shares public in these SOEs, the majority of the market capitalization is still controlled by the government, which makes these stocks illiquid and less volatile. As a result, the returns of large-cap companies have a much lower return. The difference between EWCB and EWCS is especially pronounced when Chinese stock market started to boom since 2013.

5. Empirical results

To compare different portfolios, I evaluate the performances in five measures: 1) cumulative value (hereinafter: CV), 2)10.75-year annualized return (hereinafter: AZR), 3) year-by-year annual return(hereinafter: AR), 4) annualized returns over rolling period of 1year, 3 years, 5 years and 8 years(hereinafter: RAR_1,RAR_3,RAR_5,RAR_8) and 5) average monthly return.

The formulas of the calculation are listed as follows:

1)

$$CV_t = CV_0 * (1 + R_1)(1 + R_2) \ldots . (1 + R_t)$$

CV_0 =100 on January 31, 2007;

R_1,R_2….R_{129} are monthly returns of portfolio from February 28, 2007 to October 31, 2017

2)

$$AZR = (\frac{CV_{10.2017}}{CV_{01.2007}})^{4/43}\text{-}1$$

The duration from January 31, 2007 to October 31, 2017 is equivalent to 10.75 years

3)

$$AR_1 = \frac{CV_{01.2008}}{CV_{01.2007}} - 1$$

……

$$AR_{10} = \frac{CV_{01.2017}}{CV_{01.2016}} - 1$$

$$AR_{11} = (\frac{CV_{10.2017}}{CV_{01.2017}})^{4/3} - 1$$

4)

$$RAR\_1_1 = \frac{CV_{01.2008}}{CV_{01.2007}} - 1$$

$$RAR\_1_2 = \frac{CV_{02.2008}}{CV_{02.2007}} - 1$$

……

$$RAR\_1_{118} = \frac{CV_{10.2017}}{CV_{10.2016}} - 1$$

$$RAR\_5_1 = (\frac{CV_{01.2012}}{CV_{01.2007}})^{1/5} - 1$$

$$RAR\_5_2 = (\frac{CV_{02.2012}}{CV_{02.2007}})^{1/5} - 1$$

…..

$$RAR_{3_1} = \left(\frac{CV_{01.2010}}{CV_{01.2007}}\right)^{\frac{1}{3}} - 1$$

$$RAR\_3_2 = (\frac{CV_{02.2010}}{CV_{02.2007}})^{1/3} - 1$$

……

$$RAR\_3_{94} = (\frac{CV_{10.2017}}{CV_{01.2014}})^{1/3} - 1$$

$$RAR\_8_1 = (\frac{CV_{01.2015}}{CV_{01.2007}})^{1/8} - 1$$

$$RAR\_8_2 = (\frac{CV_{02.2015}}{CV_{02.2007}})^{1/8}\text{-}1$$

……

$$RAR\_5_{70} = (\frac{CV_{10.2017}}{CV_{10.2012}})^{1/5} - 1$$

$$RAR\_8_{34} = (\frac{CV_{10.2017}}{CV_{10.2009}})^{1/8} - 1$$

5)

$$Average\ monthly\ return = \frac{\sum_1^t Rt}{129}$$

There are totally 30 decile portfolios formed with the three methods illustrated in the methodology. The performances of value and growth portfolios constructed by each method are all presented in the figures and charts in this section, but I primarily look at the performance of 4 portfolios for comparison: B/M1_value, B/M2_growth, B/M3_value, B/M3_growth.

a) B/M1_value is the portfolio consisting of 100 stocks with highest B/M ratios every year.

b) B/M2_growth is the portfolio consisting of 100 stocks with lowest B/M ratios every year.

c) B/M3_value is the portfolio consisting of top 10% stocks with highest B/M ratios every year.

d) B/M3_growth is the portfolio consisting of the bottom 10% stocks with the lowest B/M ratios every year.

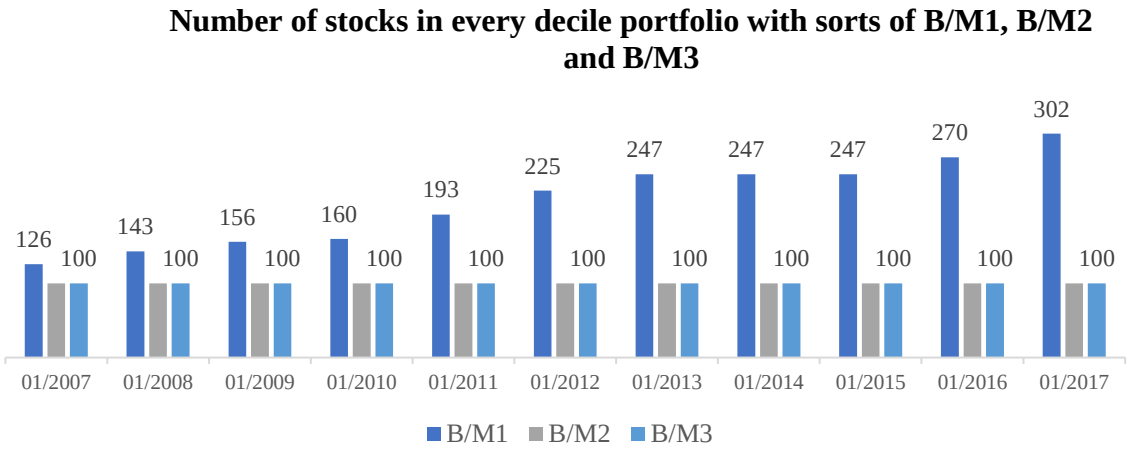
The value premium measures the difference between the performance of value portfolio and growth portfolio. In the following analysis, two measures of value premiums, VPa and VPb, are examined and they are defined as below:

VPa= B/M1_value –B/M2_growth

VPb= B/M3_value- B/M3_growth

Additionally, it's important to note that the decile portfolios created by B/M3 have increasing numbers of stocks after each rebalancing dates as shown in Figure 5 due to increasing number of new companies listed in the exchanges. The B/M1 and B/M2 keep the number of stocks in the portfolio constant but have to exclude more and more stocks in the later dates.

Figure 5. Number of stocks included in the decile portfolio with B/M1, B/M2, and B/M3 sorts on each rebalancing dates



5.1. Growth stocks vs. Value stocks

Figure 6 presents the cumulative value of value and grow portfolios constructed by each method as well as two benchmarks, EWCB and EWCS, assuming 100 RMB is invested on January 31, 2007. All portfolios are equally weighted and rebalanced annually. The results suggest that the value strategy outperforms the growth strategy over the period from January 2007 to October 2017 if we solely consider the cumulative performance over 10.75 years.

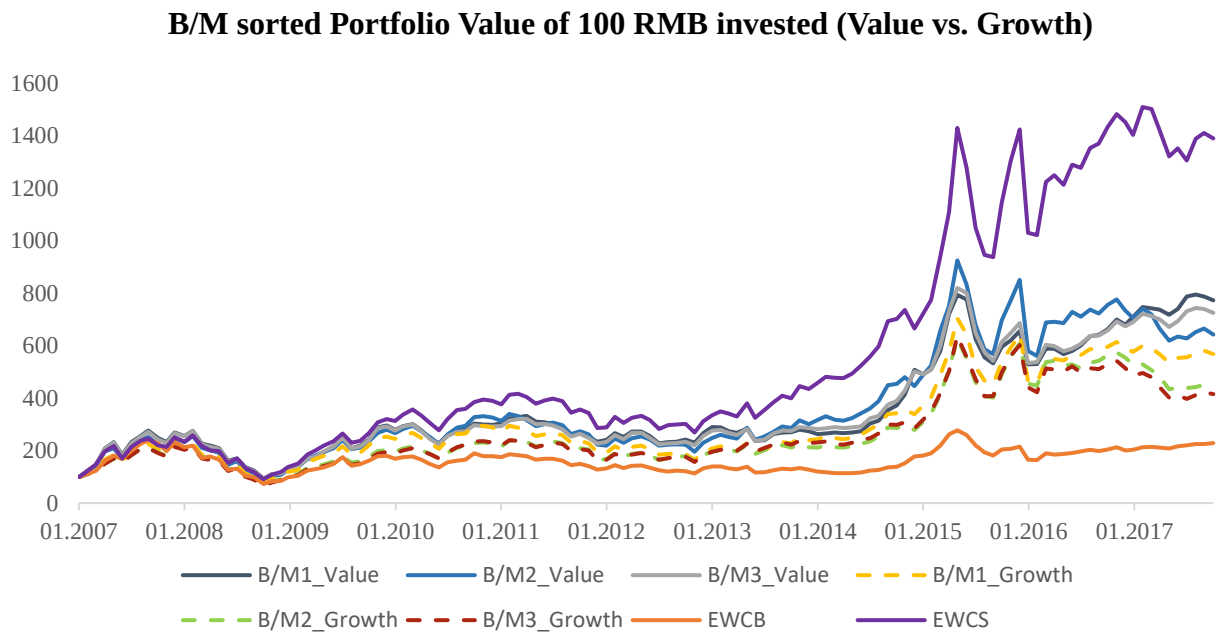
Figure 6. Cumulative performance comparison chart of value and growth portfolio with a base value of 100 (Jan 2017 to October 2017)

B/M1sorting create value and growth portfolios from the 1000 companies with the highest B/M ratios

B/M2 sorting create value and growth portfolios from the 1000 companies with the lowest B/M ratios

B/M3 sorting create value and growth portfolios from the all listed companies

All portfolios are equally weighted and rebalanced annually



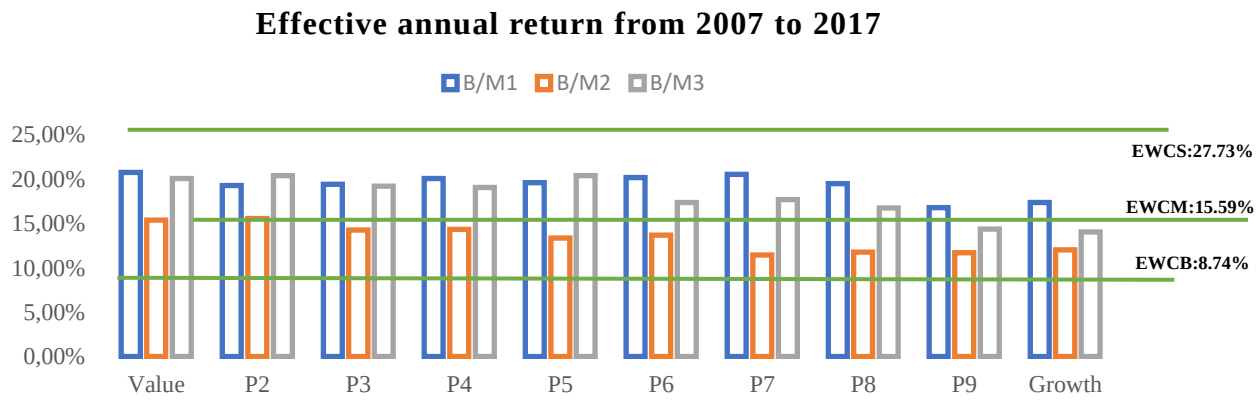
The value portfolio consisting of the 100 stocks with the highest B/M value (B/M1_value) turns 100 RMB invested on Jan 30, 2007, to 772.9 RMB on October 30, 2017, which represents an annualized return of 20,95%. The growth portfolio formed by the 100 stocks with the lowest B/M

values (B/M2_growth) turns 100 RMB invested on Jan 30, 2017, to 437.9 RMB on October 30, 2017, which is equivalent to an annualized return of 14,73%. The difference between the cumulative values of the two portfolios translates to a value premium of 335 RMB, which is more than 3 times of the initial investment. Comparing the value portfolio consisting of the top 10% stocks with the highest B/M value (B/M3_value) and the growth portfolio formed by the bottom 10% stocks with the lowest B/M values (B/M3_growth), I get the similar results. The difference between B/M3_value and B/M3_growth translates to a value premium of 309 RMB.

The cumulative performance of all growth and value portfolios lie between EWCS and EWCB. It's important to note that size plays an important role in deciding the returns of Chinese A-share. From 2013 to 2015, the Chinese stock market had an unprecedented boom. The bull market lasts for 2 years until the bubble bursts in 2015. The stock prices of a group of small-cap companies have been growing remarkably under the bull market condition. As one can see from the cumulative values of EWCS, the benchmark formed by small-cap companies had a tremendous growth from 2013 to 2015 and still gain strong momentum after the market meltdown in 2016. On the other hand, the growth of large-cap companies at the same time are much weaker. The EWCB only shows slight fluctuation while the market gets extremely volatile. As discussed earlier, this is due to the illiquidity of large-cap stocks in the Chinese stock market. Figure 7 depicts the annualized returns of all decile portfolios over the period from January 30, 2007, to October 30, 2017. Portfolios with a lower ranking are composed of stocks with higher B/M ratios while portfolios with a higher ranking are composed of stocks with lower B/M ratios. The result indicates slight downwards trend as the portfolio moves to the growth side. Besides, as a result of the very strong and persistent size factor, the returns of all portfolio fall below the EWCS index but beat the EWCB index. Compared with the EWCM index, B/M1_value, B/M2_value, and B/M3_value all

beat the market, but not B/M2_growth and B/M3_growth. I use the EWCM index as the main benchmark for the following analysis as its returns provide a better balance between stocks of large-cap SOEs companies and small-cap non-SOEs and are at a more comparative level with the portfolio returns.

Figure 7. 10.75-year annualized return for decile portfolios(January 2007 to October 2017)



The returns in Table 2 reflect the year-by-year annual performance of value and growth portfolios with the three methods from 2007 to 2017 as well as the annualized value premiums if portfolios are invested on January 31 of each year. Even though, as one could see from the results of VPa and VPb, in 3 to 4 years out of the 10.75 years, value fails to outplay growth, the value portfolio still keep a better record when the performances are solely evaluated on a year-by-year basis. Within the 10.75 years, the B/M1_value beats the market 7 times while the B/M2 growth only beats the market 4 times compared with the EWCM benchmark.

Table 2.Year-by-year annual returns of value and growth portfolios as well as the value premiums. (2007 to 2017)

Annual returns are calculated as if portfolios are invested on January 31 of the year and sold on January 31 of the next year except for the return in 2017. Return in 2017 is annualized from the 9-month return from January 31 to October 31.Shaded cells are marked to indicate the outperformance over EWCM.

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
B/M1_Value	169%	-56%	132%	7%	-23%	11%	-6%	93%	34%	29%	11%
B/M2_Value	147%	-54%	122%	22%	-29%	5%	21%	41%	74%	27%	-11%
B/M3_Value	166%	-56%	130%	6%	-23%	9%	4%	78%	40%	26%	6%
B/M1_Growth	127%	-52%	114%	18%	-29%	0%	15%	39%	73%	26%	-2%
B/M2_Growth	119%	-57%	98%	16%	-24%	9%	8%	31%	97%	22%	-20%
B/M3_Growth	114%	-57%	96%	22%	-25%	10%	17%	23%	89%	17%	-17%
EWCB	129%	-59%	88%	7%	-27%	1%	3%	38%	31%	14%	5%
EWCM	134%	-55%	113%	17%	-28%	2%	17%	35%	67%	21%	-8%
EWCS	151%	-49%	133%	25%	-24%	8%	30%	45%	97%	41%	-1%
VPa	51%	1%	35%	-8%	0%	2%	-14%	62%	-64%	7%	31%
VPb	52%	1%	34%	-17%	3%	-1%	-13%	54%	-49%	10%	23%

In order to check whether the long-run advantage of value portfolios is robust across different time frames and duration, I also examine rolling-window returns at an interval of 1, 3, 5 and 8 years. The rolling-window returns at smaller time frames also provide more realistic results for investors as a reference, since most investors won't invest in a single trading strategy for more than 10 years or within the specific period as defined in the above returns. Table 3 shows the annualized returns of B/M1_value, B/M3_value, B/M2_growth and B/M3_growth portfolios with a rolling window of 8 years. As shown in the table, the values of VPa and VPb are negative from October 2007 to December 2008, which means, if the investors get into the market during this period and invest on both growth and value portfolios for 8 years, the value portfolio would actually underperform the growth portfolio. Hence, despite the fact that value does show much better cumulative performance than growth over the whole investment horizon as shown in Figure 6,

there is no statistical evidence to prove that the value strategy would outperform growth strategy in the A-share market consistently, even if investors invest in it in the long term.

Table 3. Annualized rolling returns (RAR_8) of BM1_value, B/M3_Value, B/M2_Growth with a rolling window of 8 years from January 2007 to October 2017

Period	B/M1_Value	B/M3_Value	B/M2_Growth	B/M3_Growth	VPa	VPb
01.2007 - 01.2015	22%	22%	15%	16%	6.86%	6.42%
02.2007 - 02.2015	19%	19%	15%	15%	4.26%	3.86%
03.2007 - 03.2015	19%	19%	16%	17%	2.44%	2.66%
04.2007 - 04.2015	17%	17%	16%	16%	0.34%	0.77%
05.2007- 05.2015	17%	17%	18%	18%	-1.17%	-0.80%
06.2007- 06.2015	20%	20%	17%	17%	2.75%	3.23%
07.2007 - 07.2015	13%	14%	12%	13%	0.95%	1.34%
08.2007 - 08.2015	10%	11%	9%	9%	1.30%	1.91%
09.2007 - 09.2015	9%	9%	8%	9%	0.11%	0.26%
10.2007 - 10.2015	12%	12%	12%	13%	-0.80%	-0.41%
11.2007 -11.2015	13%	14%	15%	15%	-2.17%	-1.55%
12.2007 -11.2015	12%	13%	14%	14%	-1.90%	-1.23%
01.2008 - 01.2016	10%	10%	10%	10%	-0.60%	-0.43%
02.2008 - 02.2016	9%	9%	9%	9%	-0.58%	-0.08%
03.2008 - 03.2016	13%	13%	15%	15%	-2.33%	-1.58%
04.2008 - 04.2016	13%	14%	16%	15%	-2.67%	-1.48%
05.2008- 05.2016	13%	14%	15%	15%	-2.19%	-1.53%
06.2008- 06.2016	17%	18%	19%	20%	-2.17%	-2.11%
07.2008 - 07.2016	17%	17%	18%	18%	-0.88%	-0.70%
08.2008 - 08.2016	21%	21%	23%	23%	-1.51%	-1.31%
09.2008 - 09.2016	23%	23%	25%	24%	-2.00%	-1.37%
10.2008 - 10.2016	28%	28%	30%	30%	-2.11%	-1.81%
11.2008 -11.2016	26%	26%	27%	27%	-1.46%	-1.42%
12.2008 -11.2016	25%	25%	25%	25%	-0.25%	0.29%
01.2009 - 01.2017	24%	24%	23%	22%	1.11%	1.52%
02.2009 - 02.2017	23%	23%	22%	21%	1.69%	1.51%
03.2009 - 03.2017	20%	20%	18%	18%	2.52%	1.87%

04.2009 - 04.2017	20%	19%	17%	16%	2.94%	2.59%
05.2009- 05.2017	18%	17%	14%	14%	3.29%	2.57%
06.2009- 06.2017	17%	16%	14%	13%	3.02%	2.28%
07.2009 - 07.2017	15%	14%	12%	11%	3.36%	2.87%
08.2009 - 08.2017	18%	17%	14%	14%	4.07%	3.42%
09.2009 - 09.2017	17%	17%	14%	14%	3.53%	3.02%
10.2009 - 10.2017	16%	15%	12%	12%	3.52%	2.81%

The inconsistent long-run performance of value portfolio can be further confirmed by rolling-window returns of shorter durations as indicated in table 4. Table 4 summarizes the frequency of value portfolio's outperformance over growth with a rolling window size of one year, three years, five years and eight years respectively. The frequency is based on the comparison of annualized return between BM1_value and BM2_growth as well as the comparison of annualized return between BM3_value and BM3_growth.As one can infer from the Table 4, no matter how long an investor would stick to the value strategy during the period from January 2007 to October 2017, there's almost 50% probability that value strategy would lose to growth strategy. The frequency of value outperforming doesn't necessarily increase as the length of investment period increases.

Table 4.Frequency of value's outperforming over growth in rolling periods of one, three, five and eight years (January 2007 to October 2017)

	BM1_Value > BM2_Growth	BM3_Value > BM3_Growth
118 one-year rolling window	56.8%	60.2%
94 three-year rolling window	45.74%	53.19%
70 five-year rolling window	54.29%	47.14%
34 eight-year rolling window	52.94%	55.88%

As there's no strong evidence to support the robustness of the value effect in the long -run, it would be interesting to have a look at the short-term performances of both strategies.

Table 5. Comparison of monthly performance statistics for growth, value portfolios and EWCM (February 2007 to October 2017)

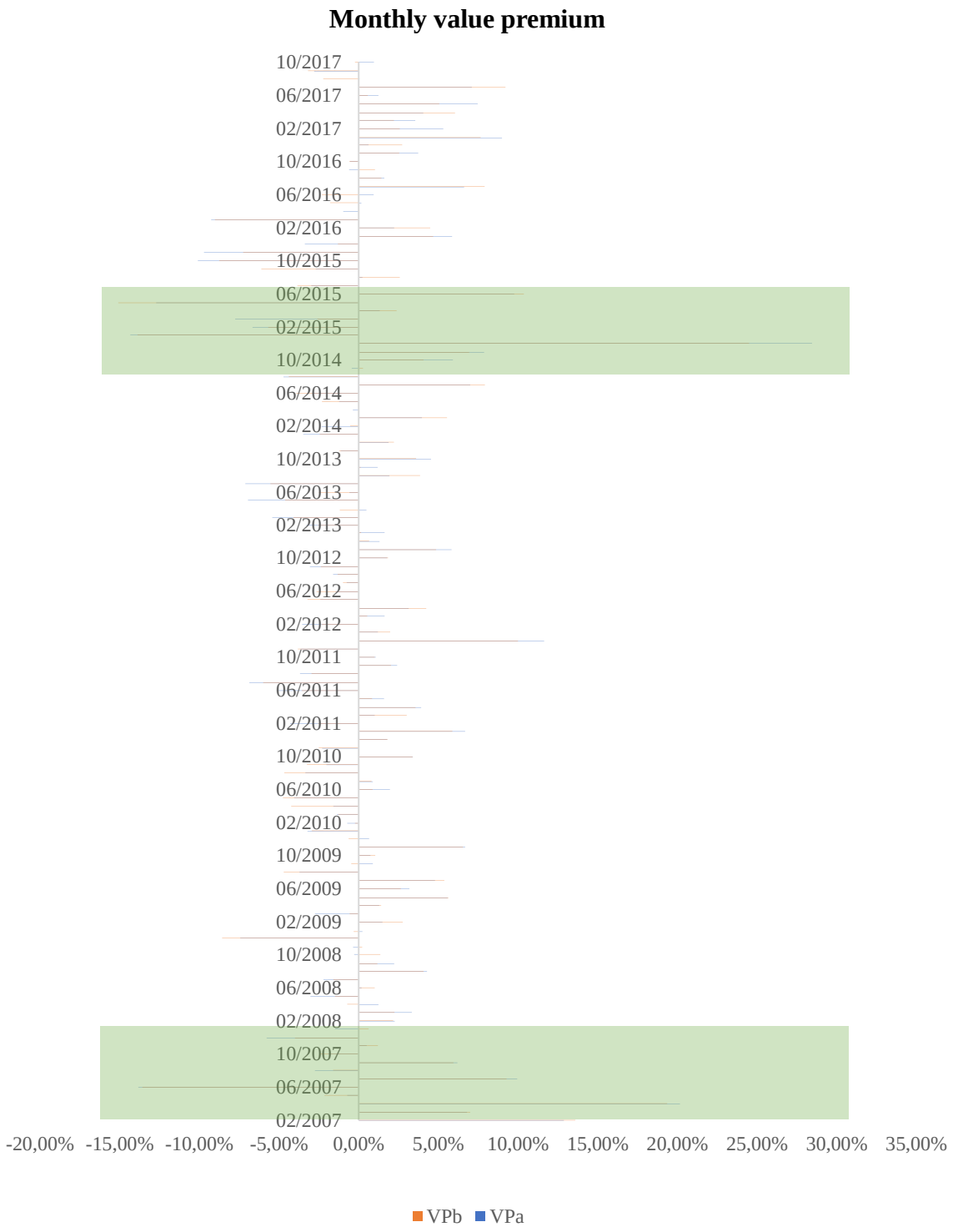
	Mean	SD	Kurtosis	Skewness	Max	Min	Beat-the-market months	Outperforming Months
B/M1_Value	2.12%	10.26%	1.58	0.21	41.92%	-25.65%	54.3%	49.6%
B/M2_Value	2.10%	11.29%	0.72	-0.01	37.75%	-31.78%	55.8%	55.0%
B/M3_Value	2.08%	10.34%	1.40	0.12	41.23%	-24.93%	51.9%	52.7%
B/M1_Growth	1.89%	10.26%	0.42	-0.21	28.83%	-27.33%	55.8%	
B/M2_Growth	1.67%	10.10%	0.37	-0.22	22.97%	-25.37%	50.4%	
B/M3_Growth	1.64%	10.14%	0.50	-0.26	27.16%	-26.83%	51.2%	
EWCM	1.79%	10.64%	0.64	-0.09	34.02%	-28.33%		
VPa	0.45%	5.63%	5.03	0.99	28.46%	-14.34%		
VPb	0.44%	5.36%	3.9	0.74	24.5%	-15.09%		

Table 5 demonstrates the descriptive statistics of monthly returns of value and growth portfolios as well as the monthly value premiums. Both measures of value premium(VPa and VPb) indicate that, at a monthly average level, there exists a weak value premium around 0.44% to 0.45%, which translate to an annualized return of 5.41% to 5.54%. My result is quite close to the findings by X. Chen, Kim, Yao, & Yu (2010) whereas they study the Chinese A-share from 1995 to 2007. Their result shows that value outperforms the growth slightly around 0.7% per month on average. Additionally, compared with EWCM, value portfolios formed by all three methods(B/M1_value, B/M2_value, B/M3_value) show higher monthly average return than the market while the growth portfolios formed by B/M2 and B/M3 shows slightly lower return. Nevertheless, the monthly outperformance is not consistent. In about half out of the 129 months along the whole investment horizon does the value portfolio fail to outplay the growth portfolio with all three methods.

Moreover, neither the value portfolio nor the growth one has a consistent beat-the-market record. Out of the 129 months, the BM3_value portfolio beats the market 67 times while the BM3_ growth portfolio beats the market 66 times. The value portfolio doesn't really demonstrate a significantly higher beat-the-market record than the growth portfolio.

Figure 8 presents the value premiums for each month from January 2007 to 2017. Bars at the right side of the axis are months in which value outperforms and the magnitude represents the strength of the value premium while the bars which fall at the left side of the axis are months with non-existent value premium. Like the long-run performance of value portfolios, there's no robust evidence to prove the consistent existence of monthly value premium. The fail-to-outperform months scatter across the investment horizon dispersedly and doesn't seem to be concentrated in the specific time frame. Though it seems to be no obvious pattern of the value premium in different market cycles, one could conjecture that the disruptive force of speculative investors could be the reason of weak value premium in the A-share market from the observation of highly volatile periods. As mentioned above, the sample time horizon I choose witnesses the burst of two market bubbles. One occurred in 2007 and the other from 2015 to 2016. In both cases, the price of the stocks increased rapidly and suddenly dropped more than 50% within months. It happens that the strongest monthly value premium occurs in these two periods, as indicated in the green areas in Figure 8, but the strong value outperformance is very soon offset by the extreme underperformances. As the market gets speculative, short-term investors trade frequently regardless the book value of the company. No fundamental-based trading strategy and factor is robust during these periods. As a result, the value of value premium swings greatly between negative and positive, therefore undermining the significance of value effect in the A-share market.

Figure 8. Value premium calculated from the difference of monthly returns between B/M1_Value and B/M2_Growth (VPa), and the difference between B/M3_Value and B/M3_Growth (VPb) (February 2007 to October 2017)



All in all, after examining the performance of value and growth portfolios sorted by B/M ratios from January 2007 to October 2017, solely based on the cumulative performances across the whole sample time horizon and the average monthly returns of each strategy, value portfolio does outperform growth portfolio. however, if we look at rolling returns at different window size and time frame, there's no strong evidence to prove that value portfolio beats the growth portfolio consistently. Even if investors invest in value portfolio for a longer duration up to 8 years, the value premium is still not robust. My result coincides with the research by Hsu et al. (2017). They find the significant value-weighted return of high-minus-low portfolio from 1996 to 2016 but the result of value premium from 2008 to 2016 is also quite weak. Over the shorter sample, they attribute the diminishing value effect to A-share's sensitivity to the global financial crisis in 2008 and the security and accounting reforms.

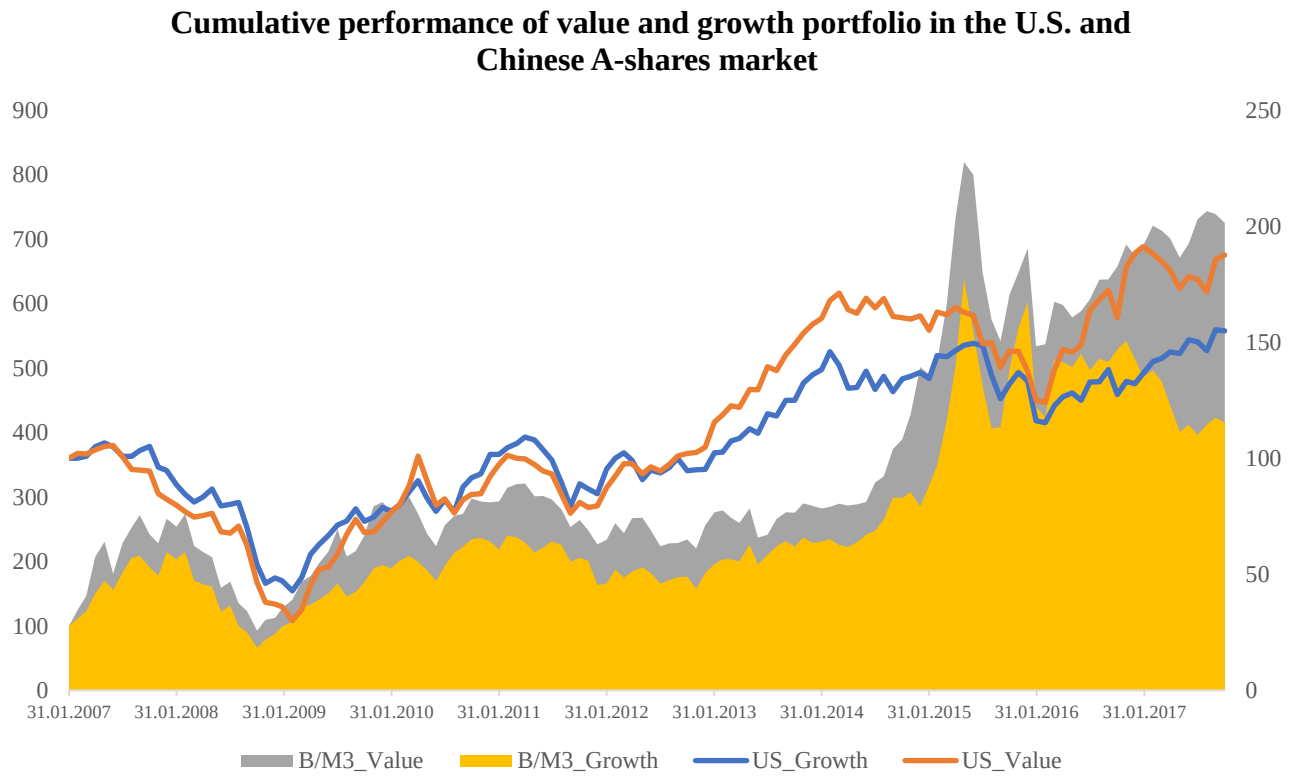
5.2. Comparison with the US market

To compare the value premium of US market during the same time horizon, I retrieved the historical monthly returns of equally weighted U.S. "low 10" and "high 10"[4] portfolios from the Fama/French research website. The low 10 and high 10 portfolio stand for the growth and value strategy in the U.S. market.

Figure 9 Comparison between the cumulative performance of portfolios in the U.S. and the Chinese market

The cumulative values of value and growth portfolios in the U.S. market are presented as orange and blue lines and in accordance to the y-axis at the right side.

The cumulative values of value and growth portfolios in the Chinese market are presented as grey and yellow stacked areas and in accordance with the y-axis at the left side.



[4] "low 10" and "high 10" are defined as univariate B/M ratio sorted decile portfolio by Fama/French research. "low 10" are growth portfolios composed of stocks with the bottom 10% B/M ratios and "high 10" are value portfolio composed of stocks with the top 10% B/M ratios. The returns of portfolios are also capital gains without taking dividends into consideration.

As mentioned in the beginning of the paper, the Chinese A-shares market is quite different from the U.S. counterpart in many ways. Particularly, it's much younger, less efficient and has unique investor structure. The solid lines in Figure 9 depict the cumulative performance of the growth and value strategy in the U.S. market from January 2007 to October 2017. Compared with the cumulative performance in the Chinese market (the stacked areas), the U.S. value and growth portfolio seems to have a much weaker but more stable growth after the financial crisis in 2008, which could be confirmed by the descriptive statistics of their monthly returns shown in Table 6. The average monthly return of both growth and value portfolios in the Chinese market is more than 2 times of that in the U.S. market but demonstrates higher standard deviation. Nevertheless, based on the cumulative performances and average monthly returns of value and growth portfolios in the U.S. and Chinese market from February 2007 to October 2017, value does outperform growth in both markets. The U.S. market shows an average monthly value premium of 0.21% while the Chinese market shows an average monthly value premium of 0.44% to 0.45%.

Table 6. Descriptive statistics of monthly return of value and growth portfolios in the U.S and Chinese market.

	Mean	Standard Deviation	Kurtosis	Skewness	Max	Min
BM1_Value	2.12%	10.30%	1.58	0.21	41.92%	-25.65%
BM3_Value	2.08%	10.38%	1.40	0.12	41.23%	-24.93%
U.S._Value	0.73%	6.97%	3.51	0.06	30.54%	-25.69%
BM2_Growth	1.67%	10.14%	0.37	-0.22	22.97%	-25.37%
BM3_Growth	1.64%	10.18%	0.50	-0.26	27.16%	-26.83%
U.S. Growth	0.53%	6.04%	1.95	-0.42	20.52%	-23.12%
VPa	0.45%	5.66%	5.03	0.99	28.46%	-14.34%
VPb	0.44%	5.38%	3.90	0.74	24.50%	-15.09%
VP_U.S.	0.21%	3.52%	0.97	0.65	11.82%	-7.49%

I conduct the same rolling-window analysis to test the robustness of value premium in the U.S. market. The results are shown in Table 7. Different from the Chinese market, the U.S. market exhibits very strong long-run advantages of the value strategy. As the investment horizon increases, the probability of the value outperformance is improved greatly. With a five-year investment horizon, the frequency of the value portfolio outperforming growth portfolio reaches almost 93%. With an eight-year investment horizon, the value investors are guaranteed an outperformance than the growth investors whenever they enter the market within the time frame from January 2007 to October 2009.

Table 7.Frequency of value's outperforming over growth in rolling periods of one, three, five and eight years (Jan 2007 to Oct 2017)

	US_Value > US_Growth
129 monthly returns	43.41%
118 one-year rolling window	53.39%
94 three-year rolling window	84.04%
70 five-year rolling window	92.86%
34 eight-year rolling window	100%

5.3. Risk measure and risk-adjusted performance

Several common risk measures, as well as risk-adjusted return metrics, are examined in this section: standard deviation, downside deviation, beta, value at risk (hereinafter: VaR), sharp ratio, Sortino ratio, and alpha. Each metric gauges different aspects of the portfolio's riskiness. All risk measures are carried upon the monthly returns from February 2007 to October 2017.

Standard deviations and downside deviations are absolute volatility measures. Beta measures the relative volatility over the market return. Value at risk models the maximum potential loss in the worst case scenario at a specific confidence level. Sharp ratio and Sortino ratio are risk-adjusted measures, estimating the excess return for each additional unit of volatility. Sharp ratio and standard deviation take both upside and downside risk into consideration, while the downside deviation and Sortino ratio only account for downside risk, which is more relevant for risk evaluation for portfolio performance. Alpha captures the excess return of a portfolio over the required return determined by the market. Both alpha and beta are estimated from the capital asset pricing model(CAPM). I use the 1-year standard bank deposit rate as the risk-free rate and EWCM as the market return for Chinese A-shares market, and "RF" and "Mkt" data from Fama/French as the risk-free rate and market return for the U.S. market, and 0 as the minimum acceptable rate. All risk measures are based on historical monthly returns.

As shown in Table 8, comparing the standard deviation and the downside deviation of growth and value portfolios in the Chinese A-share markets, the difference between the two is minimal. The results of beta estimate also indicate comparable relative risk between the two portfolios. The alpha estimates seem to imply higher abnormal return generated by value strategy but none of the alpha measurement are significant statistically. Nevertheless, the results of other risk metrics show that the value portfolio generates better risk-adjusted performance and is less

risky than the growth portfolio. Both Sortino ratio and the Sharp ratio of the value portfolio shows higher result than the growth one. The Sharp ratio of BM1 sorted value portfolio is 0.18, while that of BM2_growth is 0,14. The Sortino ratio of BM3_value value portfolio is 0.27, while that of growth portfolio is 0.20. Another risk metric I use to compare the performance is the VaR.

Table 8. Risk measurement and risk-adjusted ratios of value and growth portfolio (January 2007 to October 2017)

	Standard Deviation	Downside deviation	Beta	Sharp ratio	Sortino ratio (MAR=0%)	VaR(1%)	Alpha
BM1_Value	10.34%	6.67%	0.87***	0.18	0.28	-22.13%	0.53%
BM2_Value	11.38%	7.03%	1.05***	0.16	0.27	-25.56%	0.22%
BM3_Value	10.42%	6.85%	0.91***	0.18	0.27	-22.72%	0.43%
BM1_Growth	10.34%	6.75%	0.95***	0.16	0.25	-24.55%	0.17%
BM2_Growth	10.17%	6.76%	0.92***	0.14	0.21	-24.67%	0.01%
BM3_Growth	10.22%	6.82%	0.92***	0.l4	0.20	-25.64%	-0.03%
U.S._Growth	6.06%	4.53%	1.26***	0.05	0.10	-14.16%	-0.4%
U.S._Value	7.00%	5.05%	1.30***	0.07	0.13	-17.89%	-0.2%

*** p <.001

As the result illustrates, the one-month 1% VaR of value and growth portfolio doesn't differ greatly, but growth portfolio demonstrates slightly poorer results in the worst-case scenario. At 99% confidence level, the maximum loss of the BM1_value portfolio will not exceed -22.13%, while the maximum loss of B/M2_Growth portfolio will not exceed -24.67%. It seems that in the Chinese A-share market, at a monthly average level, the value portfolio not only have higher returns but also shows lower risk than the growth portfolio. Reverting to the U.S. market, I find that the value portfolio indicates better risk-adjusted returns but worse VaR than growth portfolio, which is consistent with the classical modern finance doctrine that higher returns are compensated with higher risk. It seems that the rule doesn't apply to the much younger Chinese market in which

value shows lower risk and higher returns. Huang and Yang (2010) draw a similar conclusion. From the sample of A-shares from 1998 to 2008, they find that "value stocks are less risky than growth stocks in terms of return volatility and estimated financial distress risk."

5.4. Value premium in big and small stocks

The previous analysis of value and growth strategies are based on the performances of univariate sorted portfolios. In this section, I sub-sort the B/M1 and B/M2 sorted portfolios according to the market capitalization, creating 30 bivariate sorted portfolios with each method.

Table 9. Average monthly returns of bivariate sorted value and growth portfolios

	Big-Cap	Medium-Cap	Small-Cap
B/M1_Value	1.42%	2.01%	2.96%
B/M1_Growth	1.27%	1.66%	2.82%
B/M2_Value	1.16%	2.15%	2.76%
B/M2_Growth	0.77%	1.57%	2.84%
VPa	0.65%	0.45%	0.12%

Each B/M sorted decile portfolio is subdivided into 3 sub-portfolios: small-cap, mid-cap and big-cap. Each B/M1 and B/M2 sorted decile portfolios comprises 100 stocks. Thus, the small-cap sub-portfolio consist of 30 stocks with the lowest market capitalization and the big-cap consist of 30 stocks with the highest market capitalization. The mid-cap sub-portfolio consist of the middle 40 stocks. The results are illustrated in Table 9, Figure 10 and 11. Figure 10 and 11 sets out the average monthly returns of all 30 sub-portfolios with B/M1 and B/M2 sorts. We can clearly see the presence of size premium in the A-shares market but not so much for the value premium. As the portfolios move to the value sides, there's no significant improvement of monthly return for portfolios with all three level of market capitalization. Table 10 summarizes the average monthly returns of each sub-portfolios generated from the value and growth strategy. As one can see, value premium does exsit in all small, mid and big companies but is quite weak. The VPa of big-cap and medium-cap amounts to 0.65% and 0.45% while VPa of small-cap is only about 0.12%. It seems

that as the size increases, the wider the value premium is. But whether the result is robust across different samples and time horizon needs further exploration and is beyond the topic of this paper.

Figure 10. Average monthly returns of decile portfolios sorted by B/M1 and size

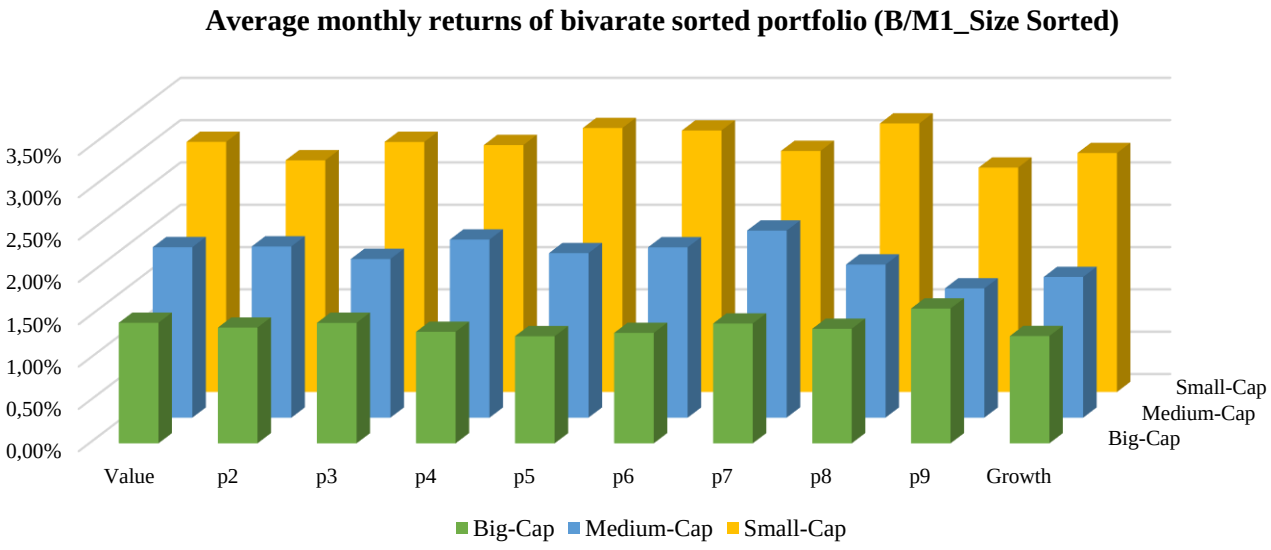
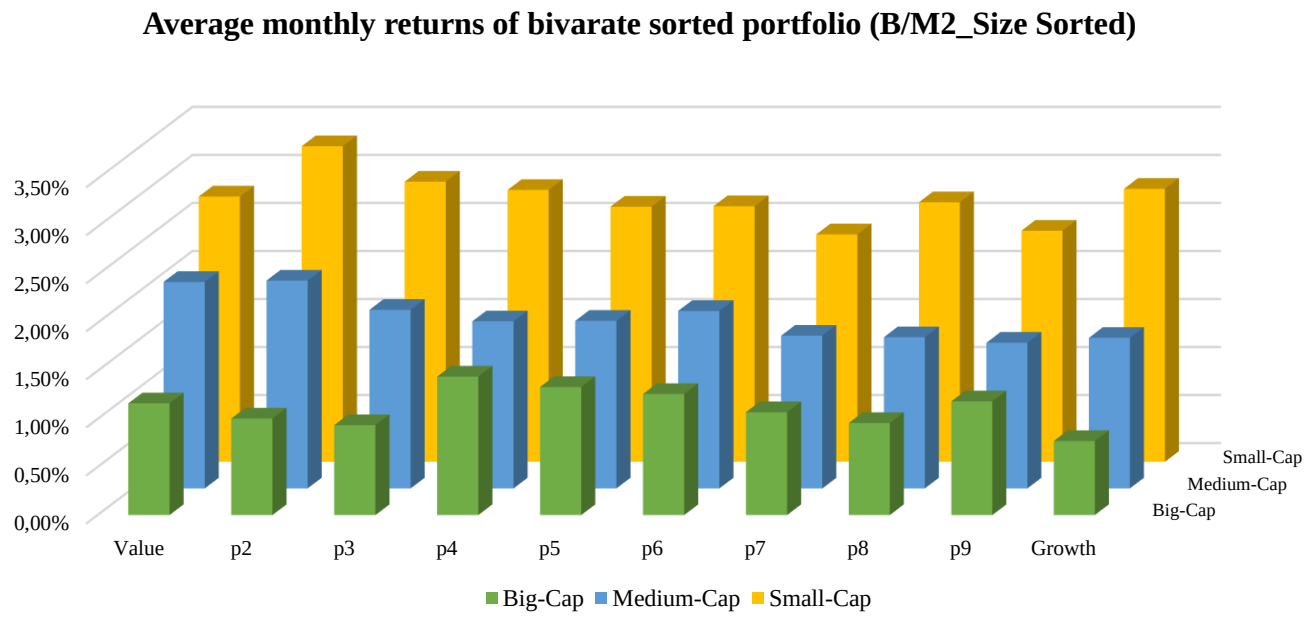


Figure 11. Average monthly returns of decile portfolios sorted by B/M2 and size



5.5. B/M vs. EBIT/EV

In order to compare B/M and EBIT/EV and see which value metric generate a value portfolio with a higher return, I first examine cumulative performances of value portfolio sorted by these two metrics. From Figure 12, the cumulative performance of all value portfolios indicates that B/M is the superior metric in selecting value stocks as value portfolios sorted by B/M generates higher cumulative returns with all three methods.The same conclusion can be drawn by comparing the average monthly return of B/M sorted value portfolios in Table 6 with that of EBIT/EV sorted value portfolios in Table 10. The value portfolios generated with EBIT/EV1 and EBIT/EV3 have an average monthly return of 1.93% to 1.96% while the value portfolios generated with B/M1 and B/M3 have an average monthly return of 2.08% to 2.12%.

Figure 12. Cumulative performance comparison chart of EBIT/EV sorted value portfolio and B/M sorted value portfolio with a base value of 100 (Jan 2017 to October 2017)

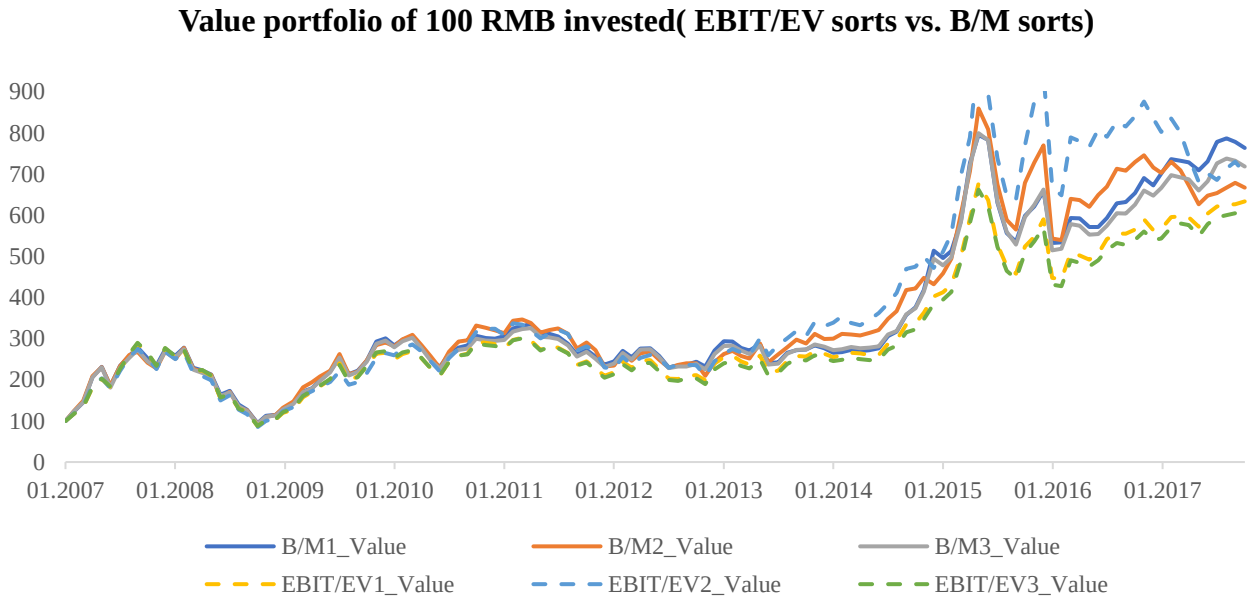


Figure 13. Cumulative Performance comparative Chart of Value and Growth portfolio with a base value of 100 (Jan 2017 to October 2017)

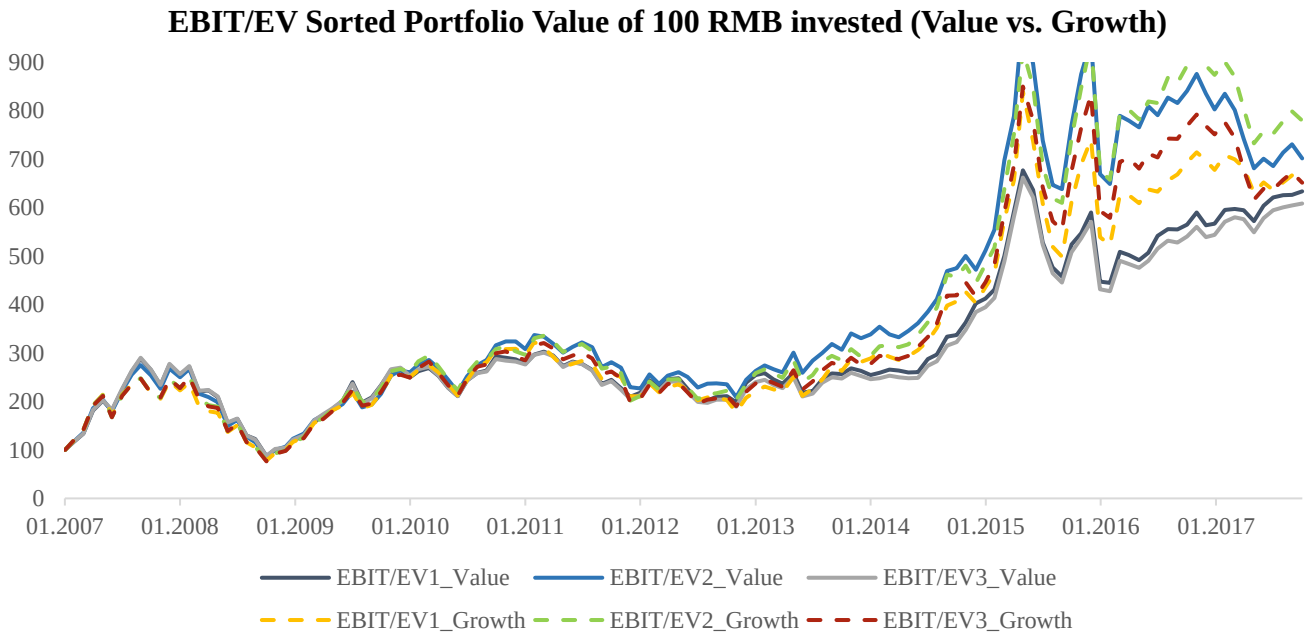


Table 10. Performance statistics of EBIT/EV sorted value and growth portfolios and the value premium

	Mean	Standard Deviation	Outperforming Month	Beat-the-market month	Sharp ratio	Sortino ratio
EBIT/EV1_Value	1.96%	10.17%	45%	49%	0.17	0.25
EBIT/EV2_Value	2.12%	10.95%	47%	56%	0.17	0.28
EBIT/EV3_Value	1.93%	10.15%	45%	50%	0.17	0.25
EBIT/EV1_Growth	2.10%	11.10%		60%	0.17	0.26
EBIT/EV2_Growth	2.26%	11.41%		57%	0.18	0.27
EBIT/EV3_Growth	2.11%	11.30%		61%	0.17	0.26
VPa’	-0.14%					
VPb’	-0.24%					

Figure 13 compares the cumulative performance of EBIT/EV sorted value portfolio with the growth portfolio. The results imply opposite conclusion as the EBIT/EV sorted growth strategy outperforms the value strategy in the long run. The examination of the monthly return also arrives at the same conclusion. As shown in Table 10, the average monthly value premium generated by EBIT/EV sorts (VPa' and VPb') indicates negative values. The comparable Sharp ratio and Sortino ratio derived by both portfolios suggests similar risk-adjusted performance. Therefore, the EBIT/EV metric fails to separate the value stocks from the growth one and doesn't have significant value effect. My research shows contrary result to Gary and Carlisle's (2013) finding on the U.S. stock market, where EBIT/EV turns out to be a superior metric in deciding value stocks by simulating historical data.

6. Conclusion

This paper compares the performance of value and growth strategy based on stocks listed on Shanghai and Shenzhen stock exchange in the post-reform period after 2007. 2007 is an important turning point of the Chinese stock market as a series of regulation changes and accounting standards adjustment has been carried out to liberate market and improve the regulatory infrastructure. Therefore, I select the post-reform period from January 2007 to October 2017, which is more representative of the present market condition, as the sample in this paper. The decile portfolios are formed based on their B/M ratios as well as EBIT/EV ratios. Each decile portfolio is equally weighted and rebalanced annually.

Following the prior literature, I find weak value premium in the last 11 years with the B/M sorts. On average, the top B/M sorted portfolio (value) outperforms, the bottom B/M portfolio (growth) 0.44% to 0.45% monthly. Solely based on the cumulative return from January 2007 to October 2017, the value portfolio generates a better result. Assuming an initial investment of 100 RMB, the value strategy generates a cumulative value of 773 RMB while the grow strategy only generates a cumulative value of 438 RMB. However, the rolling window analysis indicates that the value premium is not robust across different time frame and window size. Even though investors stick to the value strategy up to 8 years, there is about 50% chance that the value strategy underperforms the growth portfolio as one shift the investment window. However, comparing to the U.S. counterpart during the same time frame, as one increases the investment horizon, the probability of outperformance of the value portfolio is greatly improved. This might due to the limited number of samples as there is only 129 months sample available in the post-reform period. Another possible reason for the lack of long-run advantage of the value strategy in the A-share market could be the result of a large number of speculative investors. As short-term speculation

plays an important role in shaping the prices of the Chinese A-share stocks, the effect of value factor is greatly undermined. Speculative investors trade stocks for short-term gains regardless the fundamental value of the company. The value strategy which works in the U.S. market in a long-term seems to fail in the A-share market due to the disruptive forces of market speculation.

. Though failing to detect the robustness of the value strategy from the sample period chosen in this paper, it serves as an important implication to monitor the value effect on the A-share market in the future as the investor structure gets more and more diversified and market becomes more efficient.

7. Reference

Cakici, Nusret, Sris Chatterjee, and Kudret Topyan. 2015. “Decomposition of Book-to-Market and the Cross-Section of Returns for Chinese Shares.” *Pacific Basin Finance Journal* 34. Elsevier B.V.: 102–20. doi:10.1016/j.pacfin.2015.05.004.

Chang, Eric C., Yan Luo, and Jinjuan Ren. 2014. “Short-Selling, Margin-Trading, and Price Efficiency: Evidence from the Chinese Market.” *Journal of Banking and Finance* 48. Elsevier B.V.: 411–24. doi:10.1016/j.jbankfin.2013.10.002.

Chen, Can, Xing Hu, Yuan Shao, and Jiang Wang. 2015. “Fama-French in China : Size and Value Factors in Chinese Stock Returns.”

Chen, Chun-Da, Riza Demirer, and Shrikant P. Jategaonkar. 2015. “Risk and Return in the Chinese Stock Market: Does Equity Return Dispersion Proxy Risk?” *Pacific Basin Finance Journal* 33. Elsevier B.V.: 23–37. doi:10.1016/j.pacfin.2015.03.005.

Chen, Gongmeng, Kenneth A Kim, John R Nofsinger, and Oliver M Rui. 2007. “Trading Performance , Disposition Effect , Overconfidence , Representativeness Bias , and Experience of Emerging Market Investors Trading Performance , Disposition Effect , Overconfidence , Representativeness Bias , and Experience of Emerging Market Inves.”

Chen, Xinming, Peng Song, Ke Gao, and Yankuo Qiao. 2017. “The Application in the Portfolio of China’s A-Share Market with Fama-French Five-Factor Model and the Robust Median Covariance Matrix.” *International Journal of Economics, Finance and Management Sciences* 5 (4): 222–28. doi:10.11648/j.ijefm.20170504.13.

Chen, Xuanjuan, Kenneth A Kim, Tong Yao, and Tong Yu. 2010. “On the Predictability of Chinese Stock Returns.” *Pacific-Basin Finance Journal* 18 (4): 403–25.

doi:10.1016/j.pacfin.2010.04.003.

Cheung, Christopher, George Hoguet, and Sunny Ng. 2014. “Value, Size, Momentum, Dividend Yield, and Volatility in China’s A-Share Market.” *The Journal of Portfolio Management* 41 (5): 57–70. http://www.bfjlaward.com/pdf/25999/57-70_Cheung_JPM_1216.pdf.

Chin, Ming-Chin, and Ya-Chuan Chan. 2017. “An Analysis of Investment Strategies and Excess Returns in the China (Shanghai) Stock Market.” *Asian Economic and Financial Review* 7 (12): 1227–41. doi:10.18488/journal.aefr.2017.712.1227.1241.

Drew, M. E., T. Naughton, and M. Veeraraghavan. 2003. “Firm Size, Book-to-Market Equity and Security Returns: Evidence from the Shanghai Stock Exchange.” *Australian Journal of Management* 28 (2): 119–39. doi:10.1177/031289620302800201.

Fama, Eugene F., and Kenneth R. French. 1993. “Common Risk Factors in the Returns on Stocks and Bonds.” *Journal of Financial Economics* 33: 3–56. https://faculty.fuqua.duke.edu/~charvey/Teaching/IntesaBci_2001/FF_Common_risk.pdf.

———. 1998. “Value versus Growth: The International Evidence.” *The Journal of Finance* 53 (6): 1975–99. doi:10.1111/0022-1082.00080.

———. 2011. “Why Use Book Value to Sort Stocks?” https://famafrench.dimensional.com/questions-answers/qa-why-use-book-value-to-sort-stocks.aspx.

Gan, Christopher, Naiding Hu, Yaoguang Liu, and Zhaohua Li. 2013. “An Empirical Cross-Section Analysis of Stock Returns on the Chinese A-Share Stock Market.” *Investment Management and Financial Innovation,* no. 1: 127–36. https://businessperspectives.org/journals?task=callelement&format=raw&item_id=5074&elemen

t=e46cdb75-ca7e-4c69-97ee-741acaab6046&method=download&args[0]=0.

Gary, Wesley R., and Tobias E. Carlisle. 2013. *Quantitative Value: A Practitioner's Guide to Automating Intelligent Investment and Eliminating Behavioral Errors, + Website*. New Jersey: John Wiley & Sons, Inc.

Greenblatt, Joel. 2006. *The Little Book That Beats the Market*. Hoboken,New Jersey: John Wiley & Sons, Inc.

Guo, Bin, Wei Zhang, Yongjie Zhang, and Han Zhang. 2017. "The Five-Factor Asset Pricing Model Tests for the Chinese Stock Market." *Pacific-Basin Finance Journal* 43. Elsevier B.V.: 84–106. doi:10.1016/j.pacfin.2017.02.001.

Hope, Ole-Kristian, Heng Yue, and Qinlin Zhong. 2017. "China's Anti-Corruption Campaign and Firm-Level Transparency." https://ssrn.com/abstract=2899403.

Horta E Costa, Sofia (Bloomberg). 2017. "Chinese Stocks Are Becoming a World-Beating Dividend Play - Bloomberg." *Bloomberg*. https://www.bloomberg.com/news/articles/2017-04-04/china-s-stock-market-is-becoming-a-world-beating-dividend-play.

Hsu, Jason, Vivek Viswanathan, Michael Wang, and Phillip Wool. 2017. "Anomalies in Chinese A-Shares." *SSRN Electronic Journal*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2955144.

Hu, Yong, Kang Liu, Xiangzhou Zhang, Kang Xie, Weiqi Chen, Yuran Zeng, and Mei Liu. 2015. "Concept Drift Mining of Portfolio Selection Factors in Stock Market." *Electronic Commerce Research and Applications* 14 (6). Elsevier B.V.: 444–55. doi:10.1016/j.elerap.2015.06.002.

Huang, Yujia, and Jiawen Yang. 2010. "Value Premium in the Chinese Stock Market: Free Lunch or Paid Lunch?" *SSRN Electronic Journal*, no. Jan 2010: 1–31.

https://ssrn.com/abstract=1909253.

Iskyan, Kim (Stansberry Churchouse Research). 2016. “China’s Stock Markets Have Soared by 1,479% since 2003.” *Business Insider*. http://www.businessinsider.com/world-stock-market-capitalizations-2016-11?IR=T.

Jiao, Wenting, and Jean-Jacques Lilti. 2017. “Whether Profitability and Investment Factors Have Additional Explanatory Power Comparing with Fama-French Three-Factor Model: Empirical Evidence on Chinese A-Share Stock Market.” *China Finance and Economic Review* 5 (1). China Finance and Economic Review: 7. doi:10.1186/s40589-017-0051-5.

Lam, Keith S K, and Sophie Chan. 2013. “Liquidity and Stock Returns : China Evidence Liquidity and Stock Returns : China Evidence.” University of Macau.

Li, Bob, Yee Ling Boo, Mong Shan Ee, and Cindy Chen. 2013. “A Re-Examination of Firm’s Attributes and Share Returns: Evidence from the Chinese A-Shares Market.” *International Review of Financial Analysis* 28. Elsevier Inc.: 174–81. doi:10.1016/j.irfa.2013.02.007.

Li, Xindan, and Bing Zhang. 2011. “Has Split Share Structure Reform Improved the Efficiency of the Chinese Stock Market?” *Applied Economics Letters* 18 (11): 1061–64. doi:10.1080/13504851.2010.524604.

Lin, Jianhao, Meijin Wang, and Lingfeng Cai. 2012. “Are the Fama-French Factors Good Proxies for Latent Risk Factors? Evidence from the Data of SHSE in China.” *Economics Letters* 116 (2). Elsevier B.V.: 265–68. doi:10.1016/j.econlet.2012.02.026.

Liu, Qiao. 2016. *Corporate China 2.0: The Great Shakeup*. 1sted. Palgrave Macmillan US. doi:10.1057/978-1-137-55089-7.

Liu, Tianshu. 2013. “Risk and Return in Shanghai Stock Market.” In *7th Global Business and*

Social Science Research Conference.

Liu, Yucan, and Wang Ping. 2013. “Model Selection and Relationship between Idiosyncratic Volatility and Expected Stock Returns: Evidence from Chinese A-Share Market.” In *2013 10th International Conference on Service Systems and Service Management*, 522–26. IEEE. doi:10.1109/ICSSSM.2013.6602541.

Meng, Zijing, and Ronghua Ju. 2013. “Explanatory Power of Three-Factor Model on A-Share Market of Shanghai Exchange in China,” no. International Conference on Advances in Social Science, Humanities, and Management (ASSHM 2013): 252–56.

Pan, Anthony. 2015. “Common Risk Factors in China ’ S A Shares,” no. 1970: 1–14.

Ren, Daniel. 2017. “Habitual Loss-Makers Face Delisting as Chinese Regulator Toughens Stance | South China Morning Post.” *South China Morning Post*. http://www.scmp.com/business/companies/article/2074151/habitual-loss-makers-face-delisting-chinese-regulator-toughens.

Shao, Yufang. 2017. “The Comparison of Fama-French Five-Factor Model in Chinese A- Share Stock Market and in Real Estate Sector.” Aalto University School of Business.

Shen, Samuel, and John Ruwitch. 2017. “Exclusive: MSCI Warns Chinese Companies about Suspending Trading of Shares.” https://www.reuters.com/article/us-china-stocks-msci/exclusive-msci-warns-chinese-companies-about-suspending-trading-of-shares-idUSKBN1AG059.

Sun, Yuwei, Zheng Zheng, and Huiyan Dong. 2015. “Institutional Investors in Chinese Stock Markets.” In *The Chinese Stock Market Volume I: A Retrospect and Analysis from 2002*, edited by Siwei Cheng and Ziran Li, 106–86. London: Palgrave Macmillan UK. doi:10.1057/9781137391100_3.

Walkshäusl, Christian, and Sebastian Lobe. 2015. “The Enterprise Multiple Investment Strategy: International Evidence.” *Journal of Financial and Quantitative Analysis* 50 (4): 781–800. doi:10.1017/S002210901500023X.

Wang, Fenghua, and Yexiao Xu. 2004. “What Determines Chinese Stock Returns?” *Financial Analysts Journal* 60 (6). http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.80.3761&rep=rep1&type=pdf.

Wang, Yuenan, and Amalia Di Iorio. 2007. “The Cross Section of Expected Stock Returns in the Chinese A-Share Market.” *Global Finance Journal* 17 (3): 335–49. doi:10.1016/j.gfj.2006.05.007.

Wu, Yuan. 2016. “The Asymmetric Momentum Effect in the Chinese Class A Share Market Amid Market Swings.” *Asia-Pacific Financial Markets* 23 (1). Springer Japan: 107–36. doi:10.1007/s10690-016-9211-0.

Xie, Shiqing, and Qiuying Qu. 2016. “The Three-Factor Model and Size and Value Premiums in China ’ S Stock Market,” no. 1996: 1092–1105. doi:10.1080/1540496X.2016.1143250.

Xu, Jin, and Shaojun Zhang. 2014. “The Fama-French Three Factors in the Chinese Stock Market.” *China Accounting and Finance Review* 16 (2): 210–27. doi:10.7603/s40570-014-0016-0

8. Appendix

Appendix 1. Past literature about factor studies in the Chinese A-share market

Authors	Title	Time horizon	Sample	Main conclusion
Meng & Ju (2013)	Explanatory power of three-factor model on A-share market of Shanghai Exchange in China	July 2005 to June 2012	SSE (CSMAR)	The SMB(size factor) coefficient is significant but the explanatory power of the HML(value factor) is not very strong.
Xu & Zhang (2014)	The Fama-French Three Factors in the Chinese Stock Market	July 1996 to June 2013	SSE and SZE (CSMAR)	The three Factors model explain 93% of the variation of A share return. SMB factors are all significant at 5% level and HML factors are significant at 5% except for three portfolios.
Liu & Ping (2013)	Model selection and relationship between idiosyncratic volatility and expected stock returns: evidence from Chinese A-share Market	January 2000 to March 2011		No robustly significant relationship exists between idiosyncratic volatility and expected return. Size, value, turnover, liquidity are positively correlated to the weighted return but momentum is negatively correlated.

Gan, Hu, Liu, & Li (2013)	An Empirical Cross-Section Analysis of Stock Returns on the Chinese A-Share Stock Market	January 1996 to December 2005	SSE and SZE (CSMAR)	"Significant statistical evidence was found for the presence of firm size and BTM ratio (134)."
Lin, Wang, & Cai (2012)	Are the Fama-French factors good proxies for latent risk factors? Evidence from the data of SHSE in China	July 2000 to December 2009	237 SSE stocks （CSMAR）	"SMB and HML are poor proxies for the latent factors in the monthly stock return data (268)."
Drew, Naughton, & Veeraraghavan (2003)	Firm Size, Book-to-Market Equity, and Security Returns: Evidence from the Shanghai Stock Exchange	December 1993 to December 2000	SSE(Great China Database)	"Small and growth firms generate superior returns than big and value firms…the value effect is not as pervasive as was found for the US portfolios and other international markets (135)."
Chin & Chan (2017)	An Analysis of Investment Strategies and Excess Returns in the China (Shanghai) Stock Market	Jan 2003 to Jan 2015	SSE (Taiwan Economic Journal)	A long/short strategy on B/M ratio generates excess monthly returns of 0.41% while size strategy generates excess monthly return of 0.32%. Momentum works for buy-and-hold-one-month return. Though liquidity generate excess return but doesn't serve as good reference

C.-D. Chen, Demirer, & Jategaonkar (2015)	Risk and return in the Chinese stock market: Does equity return dispersion proxy risk?	July 1996 to June 2011	SSE and SZE (Taiwan Economic Journal)	a)The size and book-to-market factors are not as prevalent in the Chinese stock as in the case of the U.S. market. The results are mixed among different portfolio sort. b) Small and low-idiosyncratic volatility firms generate superior returns compared to big and high-idiosyncratic-volatility firms but the effect is not significant. c) There exists a significant and positive return dispersion effect after market, size, book-to-market and idiosyncratic volatility are controlled.
Q. Liu (2016)	Corporate China 2.0: The Great Shakeup	May 1998 to December 2012		There is a significantly positive correlation between these stock return and ROIC in the Chinese A-share market (p.66)."
Shao (2017)	The Comparison of Fama-French Five-Factor Model in Chinese A-share Stock Market and in Real Estate Sector	July 2002 to December 2015	SSE and SZE (Datastream)	"92% of the size B/M portfolios in the Chinese A-share market with low B/M ratio have higher return…..only two B/M ratio portfolios follow a pattern that the smaller size brings the higher return…Size effect does exist but is not very satisfying in the Chinese A-share market (26)."

Xinming Chen, Song, Gao, & Qiao (2017)	The Application in the Portfolio of China's A-share Market with Fama-French Five-Factor Model and the Robust Median Covariance Matrix	January 2008 to December 2008; July 2013 to June 2014; July 2014 to June 2015	SSE and SZE	" The performance of the portfolio constructed by Fama-French three-factor model is stronger than that of the Fama-French five-factor model in depressed market sentiment."
Xie & Qu (2016)	The Three-Factor Model and Size and Value Premiums in China ' s Stock Market	January 2005 to December 2012	SSE (CSMAR)	a) Three-factor model shows better explanatory power than CAPM(R^2=79.83%) b) Both size premium and value premium exists c) Size premium is not robust across different industries
Cakici, Chatterjee, & Topyan (2015)	Decomposition of book-to-market and the cross-section of returns for Chinese shares	January 1996 to December 2012	SSE and SZE (Datastream)	a) Decomposition of B/M ratio provides more explanatory power than single B/M ratio. The increase of explanatory power is mainly from change of book equity value b) Net share issue and momentum are not significant
Guo, Zhang, Zhang, & Zhang (2017)	The five-factor asset pricing model tests for the Chinese stock market	July 1995 to June 2014	SSE and SZE (CSMAR)	There are strong size and value patterns in average returns of Chinese stock market. The significance of HML is weakened by omitting the data of early years.

Hu et al. (2015)	Concept drift mining of portfolio selection factors in stock market	July 1999 to June 2012	SSE and SZE (CSMAR)	The reversion of value premium exists. Stocks with higher B/P has lower average return
B. Li, Boo, Ee, & Chen (2013)	A re-examination of firm's attributes and share returns: Evidence from the Chinese A-shares market	1999 to 2008(CSMAR)	SSE and SZE (CSMAR)	Eminent presence of the value effect is found in the Chinese A-share market. ROA and cash-flow-to-price also have explanatory power over share returns.
Wu (2016)	The Asymmetric Momentum Effect in the Chinese Class A Share Market Amid Market Swings	January 1996 to December 2010	SSE and SZE (CSMAR)	"On average, short-to-medium time horizon post-up-market momentum trading strategies outperformed post-down-market momentum.(128)."
Lam & Chan (2013)	Liquidity and Stock Returns: China Evidence Liquidity and Stock Returns: China Evidence	July 1994 to June 2012	SSE and SZE (CSMAR)	Fama-French five-factors all have different levels of explanatory power on the variations of the mean excess return. "MP, SMB, and HML are highly significant but the coefficients of LIQ and WML are relatively weaker in significance…. The evidence suggests that liquidity four-factor model is the best model for the China stock markets among other asset pricing models (29)."

T. Liu (2013)	Risk and Return on Shanghai Stock Market	2006 to 2010	SSE (Guangfa Security Company)	The result indicates value premium and reverses size premium in the Shanghai stock market.
Jiao & Lilti (2017)	Whether profitability and investment factors have additional explanatory power comparing with Fama-French Three-Factor Model: empirical evidence on Chinese A-share stock market	July 2010 to May 2015	SSE and SZE（Bloomberg）	There always exists size effect that the excess returns are negatively related to firm size, and the value effect exists only in Size-B/P portfolios.
Pan (2015)	Common Risk Factors in China ' s A Shares	January 2008 to June 2015	MSCI China A Share Index	"Size factor plays a significant role, the value, price/earnings, and dividend yield factors play a fairly significant role (13)."

Exhibit 2. Summary statistics of B/M and EBIT/EV ratios on each rebalancing date from 2007 to 2017

	BM1				BM2				BM3			
	#	Mean	Max	Min	#	Mean	Max	Min	#	Average	Max	Min
2007	100	0.47	1.57	0.22	100	0.31	0.65	0.002	126	0.40	1.57	0.002
2008	100	0.28	1.29	0.15	100	0.17	0.30	0.002	143	0.22	1.29	0.002
2009	100	0.61	2.10	0.35	100	0.36	0.60	0.027	156	0.48	2.10	0.02
2010	100	0.36	3.23	0.21	100	0.20	0.33	0.007	160	0.27	3.23	0.004
2011	100	0.42	1.85	0.25	100	0.19	0.30	0.003	193	0.30	1.85	0.003
2012	100	0.67	2.73	0.45	100	0.29	0.45	0.000	225	0.46	2.73	0.0002
2013	100	0.68	2.31	0.47	100	0.28	0.43	0.003	247	0.45	2.31	0.002
2014	100	0.76	4.49	0.46	100	0.25	0.44	0.001	247	0.46	4.49	0.0005
2015	100	0.55	5.26	0.34	100	0.20	0.33	0.001	247	0.34	5.26	0.0003
2016	100	0.65	20.45	0.37	100	0.21	0.36	0.002	270	0.37	20.45	0.001
2017	100	0.54	2.28	0.34	100	0.20	0.32	0.000	302	0.31	2.28	0.0004
Mean		0.52	4.32	0.29		0.24	0.41	0.00		0.39	4.32	0.01

	EBIT/EV 1				EBIT/ EV 2				EBIT/EV 3			
	#	Mean	Max	Min	#	Mean	Max	Min	#	Mean	Max	Min
2007	100	4.89	75.19	0.22	100	4.79	22.14	0.21	102	4.89	75.19	0.21
2008	100	2.75	17.99	0.63	100	2.10	4.52	0.10	124	2.52	15.27	0.12
2009	100	6.75	136.41	1.64	100	3.42	7.38	0.04	144	5.52	109.20	0.06
2010	100	3.54	45.84	1.10	100	1.72	3.70	0.03	152	2.80	23.31	0.04
2011	100	4.64	78.37	1.63	100	1.79	3.73	0.05	172	3.46	78.37	0.07
2012	100	7.12	53.28	3.19	100	2.31	4.58	0.06	208	4.89	52.90	0.07
2013	100	6.59	64.47	3.20	100	1.90	3.97	0.05	232	4.32	38.66	0.05
2014	100	6.86	237.50	2.69	100	1.62	3.22	0.07	240	4.36	229.23	0.08
2015	100	5.55	262.36	2.43	100	1.49	3.06	0.17	238	3.62	33.30	0.18
2016	100	3.93	26.54	1.61	100	0.90	1.89	0.11	256	2.47	23.65	0.12
2017	1000	5.01	104.41	2.23	100	1.14	2.39	0.10	290	2.53	38.82	0.10
		5.24	100.21	1.87		2.11	5.51	0.09		3.81	65.26	0.10

Exhibit 3. Histogram of the market capitalization of all sampled stocks on October 31, 2017