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Economic Analysis of an Emerging-Economy Stock Market:The Case of the Shanghai Stock Exchange

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ABSTRACT

The objective of this study is three-fold. First, this study investigates the applicability of the Capital Asset Pricing Model (CAPM) to the Shanghai Stock Exchange (SSE). This study provides the latest estimates for the firm-level and portfolio betas for 1,406 companies in the SSE. Using a simplified method to estimate the portfolio betas, this study finds that the CAPM is applicable for the case of the SSE. Second, this study also finds that international macroeconomic movements captured by GDP growth, exchange rates, and stock market indices in other major markets significantly explain the stock prices for companies listed in the SSE. Finally, this study provides a detailed characterization of firms listed in the SSE in terms of risk, return, and sectoral performance using the most recent data. Companies that are in the real estate sector in China experience a modest average return but with very little risk. Insights from this study is very relevant and important especially for foreign investors who seek to invest in an emerging market like China.

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1. INTRODUCTION

China has experienced spectacular economic growth since the economic reforms in the 1980s. Over the past thirty years, China has moved from the status of underdeveloped country to emerge as the second place of the world's largest economies, just behind the United States (Vanassche, 2015). Along with its economic growth, stock markets in China expanded rapidly following the opening of securities markets in the cities of Shanghai and Shenzhen in the early 1990s (Fernald and Rogers, 2002). There are three stock exchanges in China today: the Shanghai, Shenzhen, and Hong Kong. Both the Shanghai and Shenzhen stock exchanges were founded in 1991, and the Hong Kong Stock Exchange was founded in 1987. Since the creation of its stock exchanges, China has experienced a tremendous growth both in number of listed firms and capitalization. Nevertheless, the Chinese market and its development differ from other stock markets elsewhere (Vanassche, 2015). With a history of less than thirty years, the Chinese stock market remains to be an emerging economy market.

The analysis of the stock market is particularly interesting and important from the perspective of emerging markets such as China for several reasons. First is the scale of the Chinese stock market. As indicated previously, China has one of the largest stock markets in the world. In fact, the Shanghai Stock Exchange (SSE) is ranked fifth largest in the world and ranked number one in China in terms of capitalization (SSE, 2017). On account of its scale, it goes without saying that Chinese markets have begun to play ever more important roles in the world economy. Second is the recent liberalization of financial markets in China. According to Tian and Ma (2010), the Chinese stock markets have recently developed and opened themselves to external investors by introducing Qualified Foreign

Institutional Investors (QFII) in 2003 and opened channels to local investors to allow them to invest in external markets by implementing Qualified Domestic Institutional Investors (QDII) in 2005. Third, the Chinese stock market is volatile. It is well known that Chinese stock markets have often been described as a "casino" with a lot of speculation and high volatility[1] (Vanassche, 2015). Many studies found that the Chinese stock markets are tightly controlled by the government and the markets are at most a partially privatized one in which the state maintains state shares in varying amounts (Hou, 2007; Chui and Kwok, 1998; Yang, 2003). The presence of market segmentation and heavy government regulations give rise to mispricing, information asymmetry, and make the market clearly imperfect and incomplete, thus leading to its volatility (Hou, 2007; Chan et al., 2007).

This study provides an empirical analysis of the Chinese stock market, particularly for firms listed in the SSE. The objective of this paper is three-fold. First, this paper investigates the applicability of the Capital Asset Pricing Model (CAPM) to the SSE. The CAPM, developed by Sharpe (1964), and Lintner (1965), is widely used by portfolio managers, institutional investors, financial managers, and individual investors to predict asset returns. Moreover, financial researchers have used this model to study the performance of firms and formation of portfolios. The results from this study can help inform investors to select their investment portfolio and supply the benchmark model to evaluate the stock portfolio returns and the cost of capital in China. This study provides evidence, using the most recent and comprehensive stock price data, that the CAPM is applicable to the Chinese stock market case.

[1] According to Carpenter, et al (2015), a famous Chinese economist, Wu Jinglian, characterized China's stock market as a "casino" manipulated by speculators, misled by the central government's visible hand to unfairly support state-owned enterprises (SOEs), and without a strong link to fundamentals.

Second, this paper analyzes the effects of international macroeconomic movements to stock price returns. Over recent years an increasingly close relationship has emerged between national stock markets as a result of globalization. The opening of its stock markets to foreign investors, China as became more prone to spillover effects. This study finds that returns of companies listed in the SSE are affected by changes in the real GDP and stock indices of other major markets such as US, UK, Europe, and Japan. Also, this paper finds that exchange rates are significant in explaining returns of firms in the SSE.

Finally, this paper provides an analysis of the performance of companies in the SSE using the most recent data. Using data for more than 1,400 companies, this study finds that firms in the real estate sector in China were the top performers while firms in the commercial sector had the lowest average rate of return. The riskiest sector is the conglomerates while the least risky is the real estate sector. This study complements the growing body of knowledge on the Chinese economy by providing information about market performance at the firm-level.

The rest of this paper is structured as follows. Section 2 describes the SSE. Section 3 presents a brief review of related literature. Section 4 discusses the CAPM theory and its empirical implementation. Section 5 discusses the empirical strategy to examine the effects of macroeconomic movements to performance of firms in the SSE. The data used in the paper and their sources are described in Section 6. The empirical results, the heart of this paper, are presented in Section 7. Section 8 summarizes and concludes.

2. THE SHANGHAI STOCK EXCHANGE

The Shanghai Stock Exchange (SSE) is a stock exchange that is based in Shanghai, People's Republic of China. According to the Shanghai Stock Exchange 2017 Factbook "the SSE is the world's fifth largest stock market by market capitalization at US$3.5 trillion as of February 2016, and second largest in Asia." The SSE was founded on November 26, 1990 and started trading operations on December 19, 1990 under the supervision of the China Securities Regulatory Commission (CSRC). Most of the companies listed in the SSE are the large, state-owned companies responsible for China's economic growth.

The securities listed at the SSE include the three main categories of stocks, bonds, and funds. Bonds traded on SSE include treasury bonds (T-bond), corporate bonds, and convertible corporate bonds. SSE T-bond market is the most active of its kind in China. According to Ji and Tomas (2003), there are two types of stocks being issued in the Shanghai Stock Exchange: "A-shares" and "B-shares". "A-shares" are priced in the local Renminbi Yuan currency, while "B-shares" are quoted in U.S. dollars. Initially, trading in "A-shares" are restricted to domestic investors only while "B-shares" are available to both domestic and foreign investors. However, after reforms were implemented in December 2002, foreign investors are now allowed to trade in "A-shares" under the QFII program which was officially launched in 2003. Currently, a total of 98 foreign institutional investors have been approved to buy and sell "A-shares" under the QFII program. Quotas under the QFII program are currently US$30 billion.

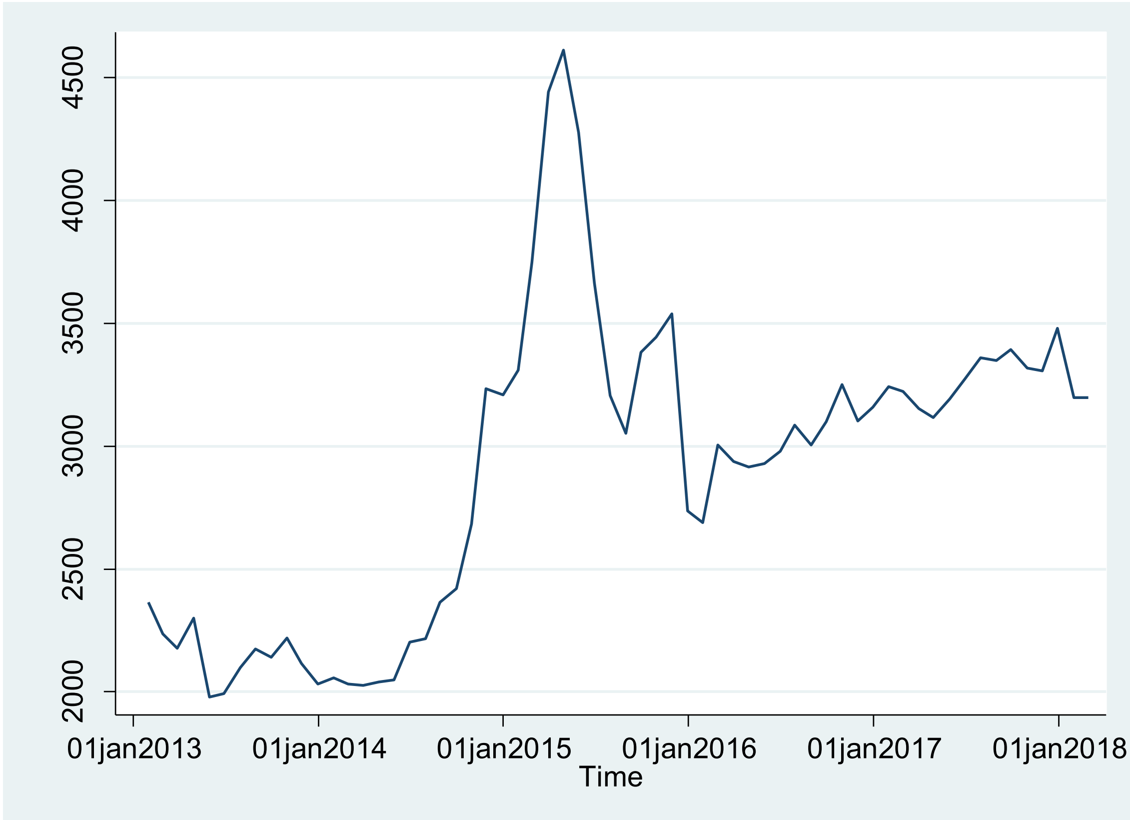

Figure 1: Shanghai Stock Exchange Composite Index, January 2013-February 2018.

Figure 1 depicts the SSE composite index which is a market composite made up of all the "A-shares" and "B-shares" that trade on the SSE from 2013 to early 2018. The index is calculated by using a base period of 100. The first day of reporting was July 15, 1991. Historically, the SSE composite index reached an all-time high of 6,092 points in October 2007 and a record low of 99 in December 1990. The figure demonstrates the volatility of the SSE. For instance, between November 2014 and June 2015, the SSE Composite shot up more than 150%, as the state-run media outlets talked up Chinese equities and encouraged inexperienced investors to buy them (Forbes, 2015). China's equity market did not draw much attention from global financial markets until the summer of 2015. As shown in the figure, the SSE composite index lost 40 percentage points from late June to late August of 2015, and at the G20 summit in early September of 2015, Zhou Xiaochuan, the governor of China's central bank, admits that the equity bubble exists in China. At a meeting of G20 finance ministers in Ankara, Zhou Xiaochuan states that a stock-market bubble in his country has “burst.” Zhou Xiaochuan used the word “burst” three times in his explanation of what is going on with the stock market (Liu et al, 2016).

3. REVIEW OF RELATED LITERATURE

There is not a lot of papers that explicitly study the performance of firms in the Chinese stock market. Earlier studies on pricing issues in the Chinese stock market start with Drew et al. (2003) who present a multi-factor model explaining returns and note that the market factor alone is not sufficient to explain the variation in the cross-section of returns in China. While they document a significant size effect, they conclude that the book-to-market effect is not as pervasive in China as in the United States.

Wang and Xu (2004) used the sample period from July 1996 through June 2002 which cover 1,195 firms listed in the Shanghai and Shenzhen stock exchanges. They found that the relative size of the firm to the market explain the cross-sectional differences in returns. Because of the speculative nature of Chinese capital markets, the large proportion of government-owned shares, and the low quality of the companies' accounting information, they added the free float (that is, the ratio of shares in a public company that are freely available to the investing public to total company shares). They found that a three-factor model that included proxies for size and exchange rate free float significantly increased the explanatory power of the market model.

Chen, et al (2010) use 18 firm specific variables that have been documented to predict cross sectional stock returns in the U.S. and examine their relationship with stock returns in China for the sample period from 1995 to 2007. They found a relatively weak predictability for Chinese stocks. Only five firm specific variables predict returns in the Chinese market.

Goh, et al (2013) empirically examine whether US economic variables are leading indicators of the Chinese stock market. They analyze stock returns predictability for the Chinese aggregate market portfolio and its thirteen industry portfolios from 1993 to 2008 consisting of 800 plus firms. The authors found that US economic variables have statistically significant predictive power for periods after China's admission into the WTO. In addition, they show that the combination of US and China economic variables is more superior in terms of forecasting ability than either single country economic variables.

Wang and Chin (2015) examined the role of the interaction between past returns and past trading volume in the prediction of cross-sectional returns over intermediate horizons in China’s stock market. Their dataset consists of all A-shares traded on the SHSE and the SZSE from July 1994 to December 2000 for 834 firms. They found that low-volume stocks outperform high-volume stocks, volume discounts are more pronounced for past winners than for past losers, low-volume stocks experience return continuations, and high-volume winner exhibit return reversals.

The impact of the Chinese monetary and fiscal policies on the equity bubble from 2008 through 2015 was studied by Liu et al (2016). They report that the Chinese equity market experienced an overvaluation or a bubble during our sample period. The bubble is primarily attributed to the investors' mispricing on the equity risk premium. Among the six major sectors in Chinese equity market, the authors found that properties sector experienced a bigger bubble than other sectors.

4. CAPITAL ASSET PRICING MODEL

The CAPM was developed by Markowitz (1959), Sharpe (1964), Treynor (1962), Lintner (1965) and Mossin (1966) and is based on the idea that not all the risks influence the prices of the assets and that a risk can be diversified and reduced by forming portfolios. CAPM describes the relationship between systematic risk and expected return for assets, particularly stocks. CAPM is widely used throughout finance for the pricing of risky securities, generating expected returns for assets given the risk of those assets and calculating costs of capital. The CAPM assumes the following about investors and assets: (a) investors are risk-averse individuals who maximize the expected utility of their wealth; (b) investors are price-takers and have homogenous expectations about asset returns that have a joint normal distribution; (c) there exists a risk-free asset such that investors may borrow or lend unlimited amounts at the risk-free rate; (d) The quantities of assets are fixed, marketable and perfectly divisible; (e) asset markets are frictionless, and information is costless and simultaneously available to all investors; (f) there are no market imperfections such as taxes, regulations, or restrictions on short selling.

4.1 Indifference Curves and the Risk – Return Space

The method used in selecting the most desirable portfolio involves the use of indifference curves. These curves represent an investor's preferences for risk and return. It can be drawn on a two-dimensional graph, where the horizontal axis usually indicates risk as measured by variance or standard deviation and the vertical axis indicates reward as measured by expected return (Bjornsson, 1998).

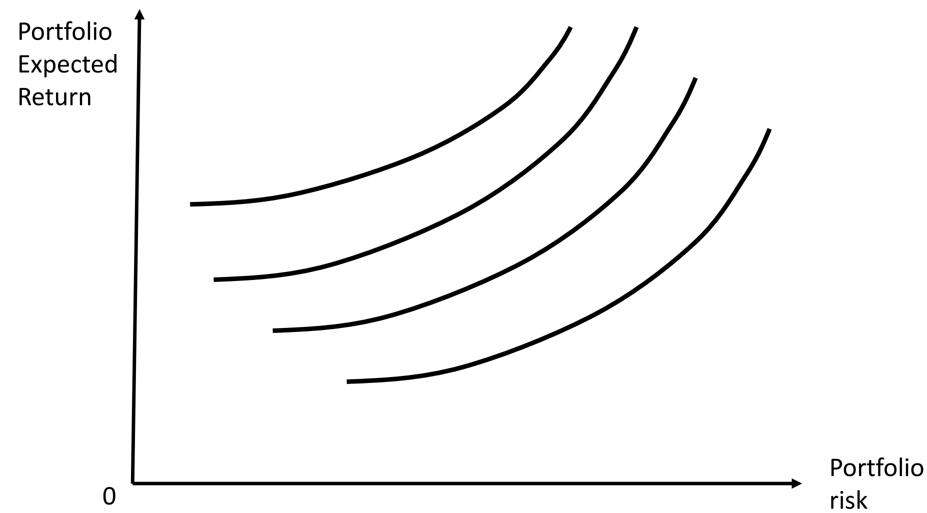

Figure 2: Investor indifference curves.

Generally, it is assumed that investors are risk averse, which means that the investor will choose the portfolio with the smaller variance given the same return. Risk averse investors will not want to take fair gambles (where the expected payoff is zero). These two assumptions of non-satiation and risk aversion cause indifference curves to be positively sloped and convex. From Figure 2 we can see that all portfolios that lie on the same indifference curve are equally desirable to the investor (even though they have different expected returns and variance.) and that indifference curves do not intersect. An investor will find any portfolio that is lying on an indifference curve that is further northwest to be more desirable than any portfolio lying on an indifference curve that is not as far northwest (Bjornsson, 1998).

4.2 The Efficient Frontier

Markowitz (1959) developed a mathematical procedure that would produce the set of theoretical best portfolios. Assume that the investor could line up a table of all the portfolios that have the same level of risk. While the risk of the different portfolios is the same, but with a different return, the choice of the best portfolio is simple, the one with the highest return. And vice versa, one would choose the one with the lowest risk. The theoretical best portfolio will have the least risk for a given expected return level and the highest expected return for a given risk level.

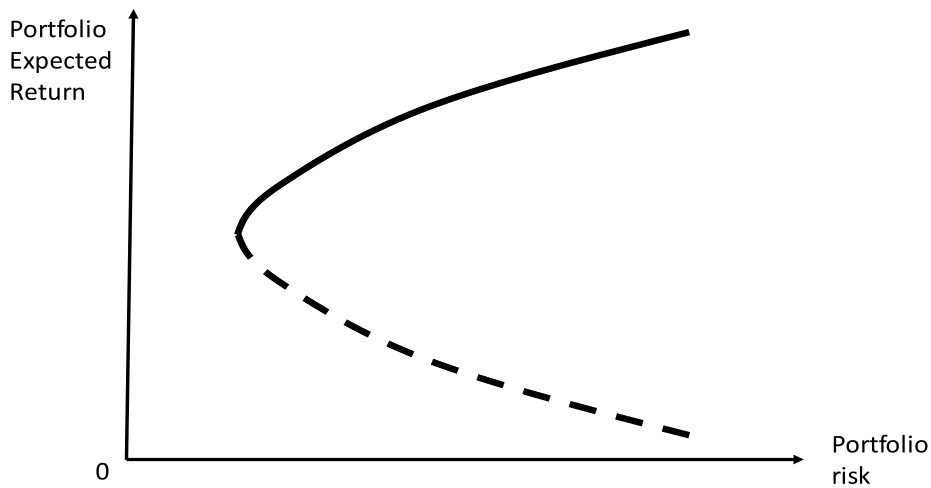

Figure 3: The efficient frontier in the portfolio return and risk space.

Figure 3 depicts the set of portfolios which satisfy the condition that no other portfolio exists with a higher expected return but with the same standard deviation of return. The CAPM assumes that the risk-return profile of a portfolio can be optimized in such a way that a certain portfolio exists with the lowest possible level of risk for its level of return. All such optimal portfolios comprise the efficient frontier as shown in the solid curve in the above figure. The dashed curve below are the inefficient portfolios.

4.3 The Capital Allocation Line (CAL)

Consider an investment in portfolio A whose return is denoted by R_A and a risk-free asset, r_f. We assume that the return of the risk-free asset is constant over the investment horizon,

$\mu_{r_f} = E[r_f] = r_f$. Since the return of the risk-free asset is constant then, $var(r_f) = 0$ and $cov(r_f, R_A) = 0$. Let x denote the share of wealth in portfolio A and $1 - x$ denote the share of wealth in the risk-free asset. The *return* of portfolio of asset A and the risk-free asset can be expressed as:

$$R_P = (1 - x)r_f + xR_A = r_f + x(R_A - r_f). \tag{1}$$

The quantity $R_A - r_f$ is called the excess return over the risk-free asset on asset A. The expected return of the portfolio can be written as:

$$\mu_P = (1 - x)r_f + xE[R_A] = r_f + x(\mu_A - r_f), \tag{2}$$

where $\mu_A = E[R_A]$ and the quantity $\mu_A - r_f$ is called the expected excess return or the risk premium on asset A.

Because the risk-free asset is constant, the variance of the portfolio only depends on the variability of asset A and is given by:

$$\sigma_P^2 = x^2 \sigma_A^2.$$

The above expression can be solved for x, therefore:

$$x = \frac{\sigma_P}{\sigma_A}. \tag{3}$$

By substituting equation (3) into equation (2), the feasible and efficient set of portfolios follows the equation:

$$\mu_P = r_f + \frac{(\mu_A - r_f)}{\sigma_A} \sigma_P, \tag{4}$$

which is simply a linear function of the risk premium of the portfolio and the portfolio expected return. Equation (4) is referred to as the Capital Allocation Line (CAL). The slope of equation (4), $\frac{(\mu_A - r_f)}{\sigma_A}$ is called the Sharpe Ratio and it is a measure of the risk premium on the asset per unit of risk.

4.4 The Capital Market Line (CML)

One of the assumptions of CAPM is that information is costless and simultaneously available to all investors. Thus, from an investor's point of view, there is one portfolio that has the highest Sharpe ratio. That portfolio will lie on the efficient frontier and is called the market portfolio. As shown in Figure 4, the Capital market line (CML), therefore, is the tangent line drawn from the point of the risk-free asset to the feasible region for risky assets. The tangency point M represents the market portfolio, so named since all rational investors should hold their risky assets in the same proportions as their weights in the market portfolio. In addition, the tangency portfolio is also tangent to the investor's indifference curve. Point M represent the highest possible utility to the investor given the risk and return of the feasible portfolios available to her.

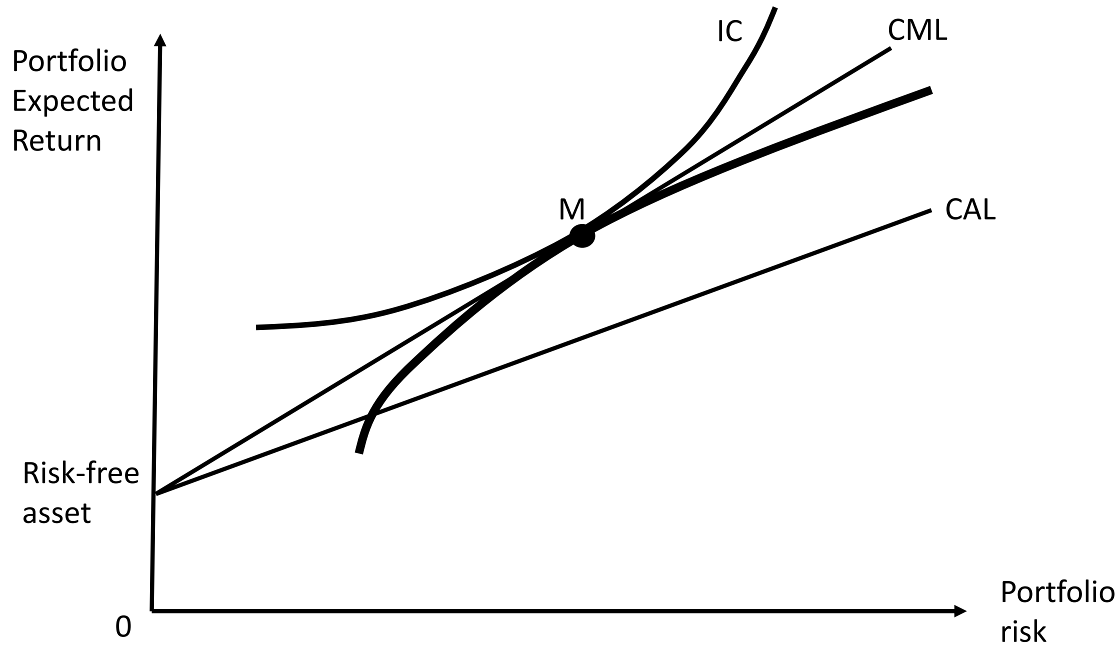

Figure 4: The market portfolio.

The CML line represents the possible combinations of the market portfolio and risk-free asset. Similarly, the CML is defined as a risk-return trade-off derived by combining the market portfolio with risk-free borrowing and lending, with all portfolios between the risk-free and the tangency point being considered to be efficient. From (4), the CML can be written as:

$$\mu_P = r_f + \frac{(\mu_M - r_f)}{\sigma_M}\sigma_P, \tag{5}$$

where $\mu_M = E[R_M]$ is the expected return on the market portfolio M. All points along the CML have superior risk-return profiles to any portfolio on the efficient frontier, except the market portfolio, the point on the efficient frontier to which the CML is the tangent.

4.5 The Security Market Line (SML)

For individual securities, the CAPM make use of the security market line (SML) and its relationship to expected return and systematic risk to show how the market must price individual securities in relation to their security risk class. The SML, also known as the CAPM equation, allows one to calculate the reward-to-risk ratio for any security in relation to that of the overall market. The SML for an asset *i* can be derived directly from equation (5):[2]

$$E[R_i] = r_f + \beta(E[R_M] - r_f), \qquad (6)$$

where $\beta = \sigma_{i,M}^2/\sigma_M^2$. Equation (6) says that the expected excess return of any asset i, $E[R_i] - r_f$, is proportional to the expected excess return of the market portfolio, $E[R_M] - r_f$, where the constant of proportionality is the relative riskiness of the asset, β. Note that the market portfolio has a β equal to unity. Assets for which $\beta > 1$ are described as aggressive stocks and assets for which $\beta < 1$ are described as defensive stocks.

4.6 CAPM as a Regression

In this section we explain the procedure to test the CAPM. The procedure here is a simplified version of the procedures discussed in Fama and French (1992) and Fama and MacBeth (1973). The procedure is as follows:

Step 1. The log returns are computed for each company $i = 1, \dots N$ and the market return $i = M$ by using the following formula:

[2] The detailed steps on deriving the SML from the CML can be found in Spence (1984).

$$R_{it} = \ln\left(\frac{P_{it}}{P_{it-1}}\right) = \ln(P_{it}) - \ln(P_{it-1}), \tag{7}$$

where P_{it} is the stock price at time *t*.

Step 2. The excess return for each company i is computed using the formula $Z_{it} = R_{it} - r_{ft}$, where *R* is the log return.

Step 3. Estimate the β for each company *i* using the specification in equation (6):

$$Z_{it} = \alpha_i + \beta_i Z_{Mt} + e_i, \tag{8}$$

where Z_{Mt} is the market excess return, α is the constant of the regression, and *e* is the error term. The regression in equation (8) is time series regression for each firm. This is known in the literature as the "first pass regression".

Step 4. Rank the companies according to their estimated $\hat{\beta}_i$ (from the third step) and we construct portfolios of equally-weighted stocks. Specifically, the first portfolio contains companies with the largest value of betas and the last portfolio contains companies with the smallest value of betas.

Step 5. Compute the average return for each company over the period of study, *T*:

$$\bar{Z}_i = \frac{1}{T}\sum_{t=1}^{T} Z_{it}, \tag{9}$$

Step 6. Let *J* be the number of companies in each portfolio and *k* the portfolio. Estimate the excess portfolio returns by averaging the realized excess returns of each k portfolio using the following formula:

$$\overline{\Pi}_k = \frac{1}{J}\sum_{i=1}^{J} \bar{Z}_i. \tag{10}$$

Also, the estimated portfolio β is computed:

$$\bar{\beta}_k = \frac{1}{J}\sum_{i=1}^{J} \bar{\beta}_i. \tag{11}$$

Step 7. Estimate the following cross section regression or "second pass regression":

$$\bar{\Pi}_k = \lambda_0 + \lambda_1 \bar{\beta}_k + \varepsilon_k, \tag{12}$$

where λ_0 is the intercept, λ_1 is the market risk premium which the regression coefficient in this regression, and ε_k is the error term. If CAPM holds, the value of λ_0 should be zero and λ_1 should be positive and statistically significant.

5. INTERNATIONAL MACROECONOMIC MOVEMENTS

The extent to which the Chinese stock market have become integrated with macroeconomic movements in other countries is an important empirical question. To determine whether there is a connection between Chinese stock market performance and GDP of other countries, the following regression model is estimated:

$$\log(P_{it}) = a_i + b_i \log(GDP_{ft-1}) + \gamma_i + \xi_t + v_i, \tag{13}$$

where GDP_f a vector for the real GDP of f countries, γ_i are industry fixed effects, and ξ_t is the time fixed effects. The GDP of US, UK, EU, and Japan were considered in this study. The regressors were lagged one period to reduce the possibility of endogeneity bias.

It is possible that there is a significant relationship between national stock markets (i.e., China and US, China and EU, etc.) and their respective exchange rates as a result of the rising flows of capital between international financial markets. To test the foregoing hypothesis, another regression is estimated using the following specification:

$$\log(P_{it}) = a_i + b_i \log(FOREX_{ft-1}) + \gamma_i + \xi_t + v_i, \quad (14)$$

where $FOREX$ a vector for exchange rates. Precisely, the exchange rate between Chinese Renminbi and the following four currencies were considered in this study: US Dollar, Euro, UK Pound Sterling, and Japanese Yen.

Finally, it is very likely that movements in stock markets in other countries could affect the market performance of Chinese firms. To test this hypothesis, the following regression model is estimated:

$$\log(P_{it}) = a_i + b_i \log(INDEX_{ft-1}) + \gamma_i + \xi_t + v_i, \quad (15)$$

where $INDEX$ is a vector that contains the following composite indices: Dow for the US, Nikkei for Japan, and Dax for Germany.

6. DATA

The stock returns data used in this paper was sourced from Thomson Reuters. The stock returns data came in the form of end-of-month adjusted closing price for 1,406 “A share” firms listed in the Shanghai Stock Exchange (SSE). An adjusted closing price is a stock’s closing price on any given period of trading (i.e., monthly) that has been amended to include any distributions and corporate actions that occurred. The adjusted closing price is often used when examining historical returns or performing a detailed analysis on historical returns. The proxy for the market is the SSE Composite Index also known as SSE Index is a stock market index of all stocks (A shares and B shares) that are traded at the SSE. The data considered in this study spanned from January 31, 2013 to February 28, 2018, about a five-year period. The Chinese risk-free rate was taken from the Federal Reserve Bank of

St. Louis (FRED) for the same period. The data for GDP and exchange rates for the US, Japan, EU, and UK were sourced from the FRED. The data for the DOW, NIKKEI, and DAX were downloaded from Yahoo Finance website.

7. EMPIRICAL RESULTS

7.1 Market performance

Table 1 provides a description of the stock returns for companies listed in the SSE. As indicated previously, this study considers only all of the "A share" companies listed in the SSE from January 2013 to February 2018. The market performance of companies listed in the SSE during the period of study can be considered as modest with 1.00% average rate of return. The company that achieved the highest average return during the period of study is "Changzhou Langbo Seal Polytron Technologies Co. Ltd." (code: 603655) at 82%. This company designs, produces, and sells rubber seals and rubber products used in automotive air conditioning, power, braking and other core systems. The company that experienced the lowest average return is "Xinjiang Torch Gas Co. Ltd." (code: 603080) at -28.11%. "Xinjiang Torch Gas Co. Ltd." engages in the natural gas transmission business in China. It serves commercial class restaurant users, large industrial users, and households, as well as a network of bus transport vehicles, taxis, and other types of dual-fuel refueling vehicle users. The company was founded in 2003 and is based in Kashgar, China.

Table 1 also provide information on the performance of companies across the different sectors. The SSE groups the companies into five sectors: industrial, conglomerate, commercial, real estate, and utilities. Majority of the companies (66%) are grouped in the industrial sector, 15% in the conglomerate, 9% in the commercial sector, 8% in the utilities sector, and 25 in the real estate sector. Among the sectors, the real estate sector was the top performer at 1.79% average rate of return while the commercial sector had the lowest average rate of return at 0.32% during the period of study. The riskiest sector is the conglomerates with standard deviation of 6.68 while the least risky is the real estate sector at 0.93 standard deviation.

Table 1: Descriptive statistics of stock returns.

Sector	No. of Firms	Mean	Std. Dev.	Min	Max
Total	1,406	1.00	5.59	-28.11	82.29
Industrial	933	1.00	5.61	-22.10	82.29
Conglomerate	208	1.51	6.68	-13.75	61.52
Commercial	126	0.32	5.09	-20.97	25.76
Real Estate	23	1.79	0.93	0.16	4.11
Utilities	116	0.68	4.00	-28.11	21.97

Source: Shanghai Stock Exchange, computed by author.

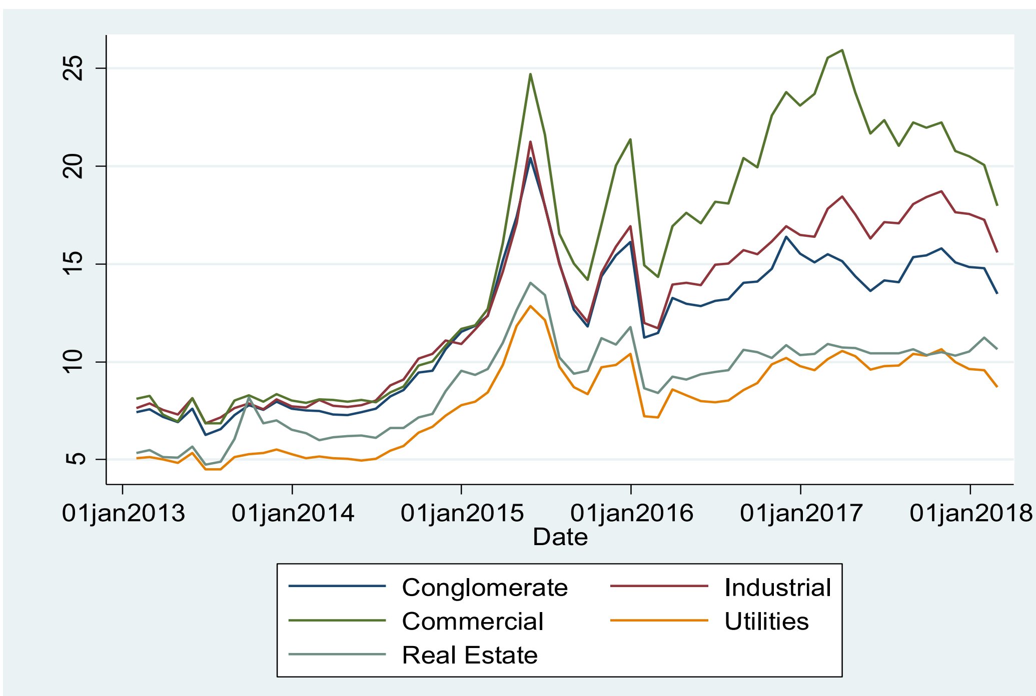

Figure 5: Stock prices from January 2013 to February 2018, by sector.

Figure 5 depicts the performance of each of the sectors during the period of study. The figure indicates that stocks in the commercial sector are high-priced while those in the utilities and real estate sectors are low-priced. In addition, the graph provides a convincing evidence that the price of stocks across sectors follow the overall market performance (as measured by the SSE composite).

Table 2: Winners and losers.

Winners	% return	Sector
Longi Green Energy Technology Co. Ltd.	1,093	Industrial
SJEC Corporation	863	Industrial
Nanjing Xinjiekou Department Store Co. Ltd.	645	Commercial
Ning Xia Heng Li Steel Wire Rope Co. Ltd.	510	Industrial
Hengtong Optic Electric Co Ltd	508	Industrial
Hubei Jumpcan Pharmaceutical Co. Ltd.	440	Industrial
Changchun Sinoenergy Corporation	439	Commercial
Shenzhen Kingdom Technology Co. Ltd.	429	Conglomerate
Anxin Trust Co. Ltd.	395	Conglomerate
Jonjee Hi-Tech Industrial and Commercial Holding Co. Ltd.	394	Industrial

Losers	% return	Sector
Guanghui Energy Co. Ltd.	-73	Industrial
Shanghai Prosolar Resources Development Co. Ltd.	-68	Conglomerate
Sinovel Wind Group Co. Ltd.	-67	Industrial
Henan Dayou Energy Co. Ltd.	-67	Conglomerate
Anhui Golden Seed Winery Co. Ltd.	-63	Conglomerate
Shanxi Lanhua Sci-Tech Venture Co. Ltd.	-63	Industrial
Shanxi Coal International Energy Co. Ltd.	-60	Industrial
Dalian Dafu Enterprises Holdings Co. Ltd.	-59	Industrial
Guizhou Panjiang Refined Coal Co. Ltd.	-59	Industrial
Anyuan Coal Industry Group Co. Ltd.	-57	Industrial

The top 10 winners and losers for the period of study (2013-2018) are presented in Table 2. The winners (and losers) are determined by computing each company's percentage change in stock price between the beginning-of-period and end-of-period. Among the more than 1,400 firms listed in the SSE, the best performer was "Longi Green Energy Technology Co. Ltd." (code: 601012-SH). This company manufactures and sells silicon rods and silicon wafers. If one were to buy a stock for one dollar from this company in January 1, 2013, its value as of January 1, 2018 will be $1,093. The worst performer is "Guanghui Energy Co. Ltd.". This company engages in the energy development business in China. The company develops coal resources; explores and develops oil and gas resources; and produces and sells liquefied natural gas.

7.2 Risk and Return across firms

Figure 6 presents the risk and return profiles of companies in the SSE. The value in the vertical axis is the percentage change of the stock price for each company and then averaged for the period of study. The value in the horizontal axis is the standard deviation of the stock price returns for each company. We can see in the figure that there is indeed a positive correlation between expected return and risk. Companies that have high expected returns are very risky, i.e. have very high standard deviation. Less risky firms, those with low standard deviations, have a low expected return. The sector with the highest return to risk correlation is the conglomerate sector with a correlation coefficient of 0.85. The sector with lowest correlation is utilities with 0.60. Overall, the correlation for all "A-shares" is 0.78.

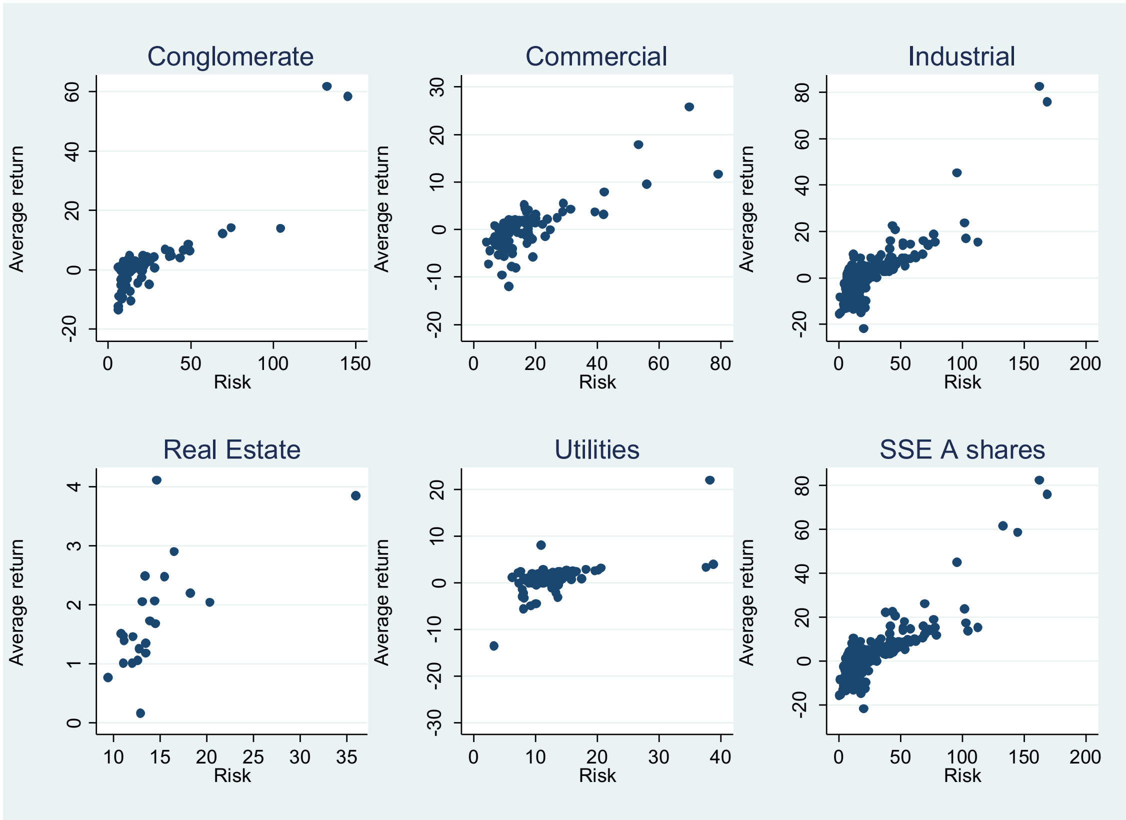

Figure 6: Return and risk profiles by sector.

7.3 First Pass Regression Results

In order to test the applicability of CAPM, we conduct two stages of regression, the first pass regression is on the time series data to compute the beta for each company in the sample (see equation 8) and the second pass regression equation is cross section regression equation to test the CAPM (see equation 12). This section discusses the results of first pass regressions for individual companies listed in the SSE. In the first pass regressions, 1,406 alphas (α), betas (β), and R squared values were estimated corresponding to each firm in the sample. The densities of the estimates for alpha and beta for each firm in the sample is shown in Figure 7.

Table 3: Estimates from first pass regressions.

	Mean	Std. Dev.	Min	Max
Alpha				
All firms	**-0.20**	**6.06**	**-87.71**	**74.72**
Industrial	-0.19	6.28	-87.71	74.72
Conglomerate	-0.24	7.38	-77.61	50.41
Commercial	-0.78	4.31	-12.42	22.12
Real Estate	1.15	0.89	-0.49	3.33
Utilities	0.15	3.17	-18.91	19.01
Beta				
All firms	**0.10**	**1.34**	**-28.77**	**6.24**
Industrial	0.12	1.34	-28.77	6.24
Conglomerate	-0.02	1.86	-23.49	2.05
Commercial	0.04	0.95	-5.18	3.31
Real Estate	0.22	0.24	-0.61	0.54
Utilities	0.21	0.37	-1.75	1.01
R squared				
All firms	**0.04**	**0.08**	**0.00**	**0.95**
Industrial	0.04	0.08	0.00	0.93
Conglomerate	0.05	0.11	0.00	0.95
Commercial	0.06	0.09	0.00	0.61
Real Estate	0.03	0.02	0.00	0.09
Utilities	0.04	0.03	0.00	0.20

The alpha can be considered as a measure of the active return on an investment or the performance of that investment compared with a suitable market index. It can be shown that in an efficient market, the expected value of the alpha coefficient is zero. Therefore, the value of the alpha coefficient indicates how an investment has performed after accounting for the risk it involved. Table 3 shows that the average alpha is -0.20 which suggests that, on average, the stock returns for the companies has earned too little for its risk. The company with the lowest estimated alpha is "Jiangsu Luokai Mechanical and Electrical Co. Ltd." (code: 603829) with an alpha value of -18.66. The sector with the lowest average alpha is the commercial sector with an estimated average alpha of -0.78. The results of the first pass regressions also indicate that about 64% of companies have positive alphas. A positive value for alpha suggests that the investment has a return in excess of the reward for the assumed risk. In other words, a positive alpha means that the company has a higher expected rate of return than their actual rate of return, which states that they are over-valued by the market and investors. The firm that achieved the highest alpha is "Ningxia Jiaze Renewables Corporation Limited" (code: 601619) with an alpha value of 74.72. The sector with the highest alpha is real estate with an estimated average alpha of 1.15.

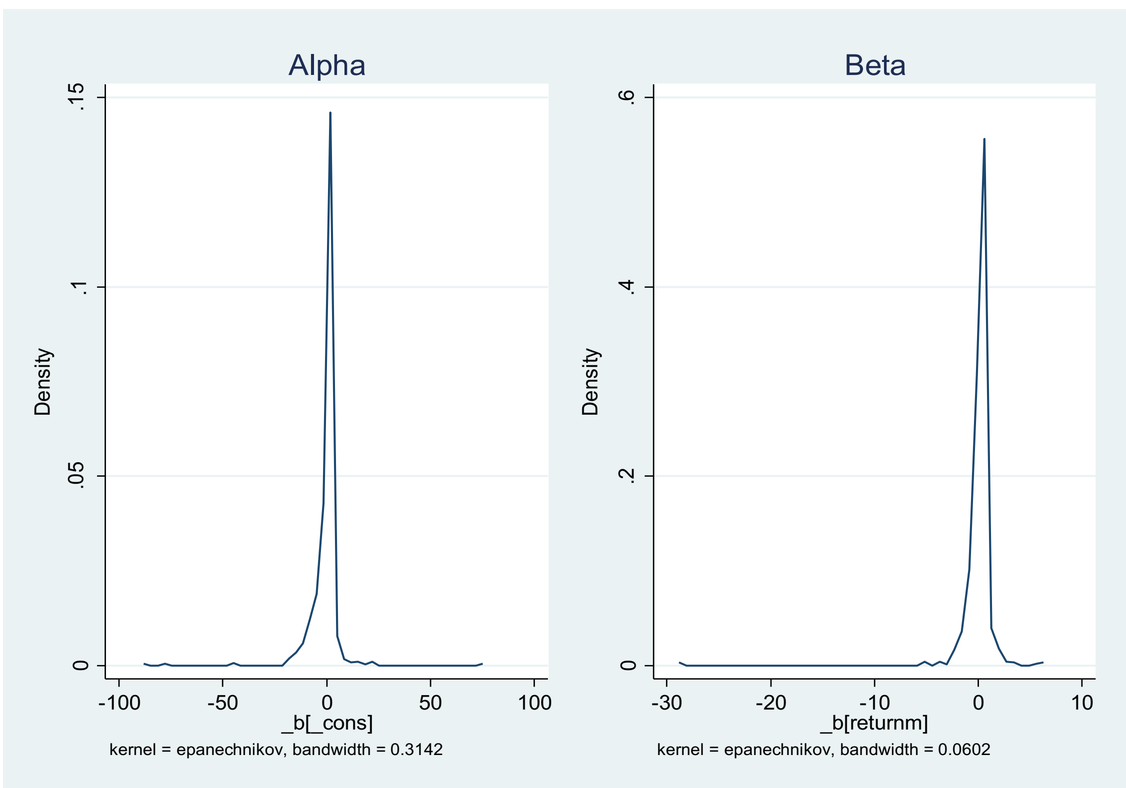

Figure 7: Densities of estimated α and β from first pass regressions.

The beta measures the tendency of a company's returns to respond to swings in the market or the systematic risk of a stock. A beta value of 1 indicates that the security's price will move along with the market. A beta between zero and 1 means that the security will be less volatile than the market. A beta of greater than 1 indicates that the security's price will be more volatile than the market. Majority (73%) of the estimated betas are between zero and 1, 5% have betas that are greater than 1, and 22% have betas that are negative. Note that the return for companies that have negative betas are inversely related to the market. The company with the lowest nonnegative beta is "Yindu Kitchen Equipment Co. Ltd." (code: 603277) with an estimated beta of 0.001. The company that achieved the highest beta is "L & K Engineering Co. Ltd." (code: 603929) with an estimated beta of 6.24. The results in Table 3 indicate that the estimated beta is, on average, 0.10 for the companies in the sample. The sector with the highest average beta is real estate with an estimated beta of 0.22. The negative average for conglomerates suggest that companies in this sector move against the market.

The R squared is a statistical measure that represents the percentage of a company's stock return movements that can be explained by movements in the market excess returns. An R squared of 1.00 indicates that all movements of a company's stock return are completely explained by movements in the market excess returns. A low R squared, below 0.70, indicates the company's stock return performance patterns have been in line with the market excess returns. As shown in Table 3, the estimated R squared for companies in the sample are very low with an average of 0.04.

7.4 Second Pass Regression Results

The estimates from the first pass regressions were used to group the 1,406 companies according to their betas (from highest to lowest). The companies were grouped together to form 150 equally-weighted portfolios according to the beta groupings. The combinations of excess returns and estimated betas for the portfolios are depicted in Figure 8. It is clear from the figure that there is a positive relationship between the beta and excess returns for the portfolios. The solid red line is the estimated linear fit which can be considered as the SML for the 150 portfolios.

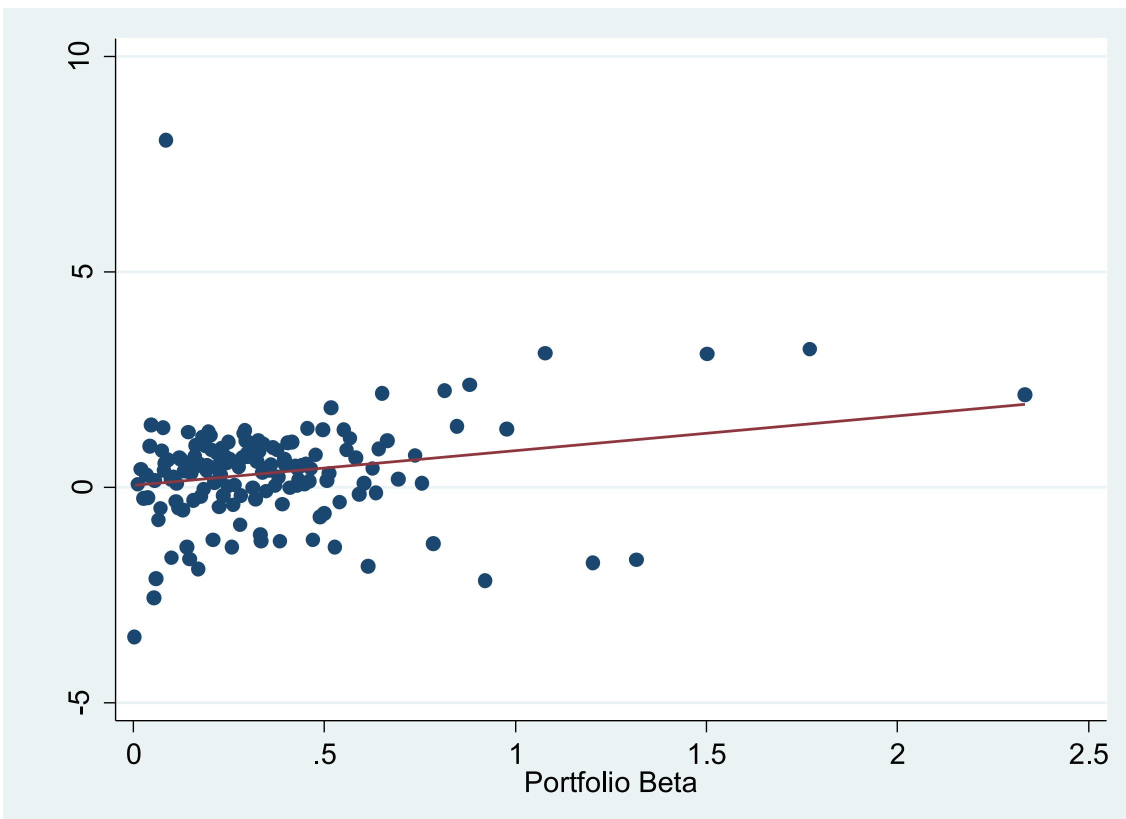

Figure 8: Estimated portfolio excess returns and betas.

Table 4 presents the results of the second pass cross sectional regressions. Column (1) summarizes the estimates using the specification in equation (12). The results provide evidence that CAPM is supported by data from the SSE. Precisely, the estimated coefficient for the portfolio beta is positive and statistically significant. The results suggest that a positive linear relationship exists between systematic risk and rate of return, so systematic risk has effects on asset pricing process. The result of the second pass regression also shows that the constant term is not significantly different from zero which is consistent to the predictions of CAPM.

Table 4: Second pass cross-sectional regressions.

Variable	**(1)**	**(2)**	**(3)**
Portfolio beta	0.819***	0.305	1.223**
	(0.301)	(0.699)	(0.484)
Portfolio beta squared		0.312	
		(0.391)	
Residuals from first pass			0.015
			(0.038)
Constant	0.041	0.152	-0.357
	(0.148)	(0.203)	(0.484)
R squared	0.467	0.508	0.734
Observations	150	150	150

Notes: Standard errors in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%.

The CAPM predicts a linear relationship between systematic risk and portfolio excess returns. To test the linearity prediction, the square of the portfolio beta was included in the regression:

$$\overline{\Pi}_k = \lambda_0 + \lambda_1 \bar{\beta}_k + \lambda_2 \bar{\beta}_k^2 + \varepsilon_k, \quad (16)$$

If the linearity prediction holds, then the estimated coefficient for the squared beta, λ_2, should not be statistically significant. The results from column (2) of Table 4 indicate that indeed the linearity prediction is supported in the data for the SSE. However, the estimated coefficient for the portfolio beta is not statistically significant.

Another prediction of the CAPM is that the only risk which is relevant is the systematic risk which is captured through beta factor. To test this prediction, the average residuals $\bar{e}_k$ from the first pass regression is included in equation (12):

$$\overline{\Pi}_k = \lambda_0 + \lambda_1 \bar{\beta}_k + \lambda_3 \bar{e}_k + \varepsilon_k, \quad (17)$$

If the beta factor is the only source of systematic risk, then the coefficient λ_3 should not be statistically significant. The results from column (3) of Table 4 suggest that the beta factor is relevant in explaining the systematic risk for the portfolios in the sample. Precisely, the estimated coefficient λ_3 is not statistically significant and that the estimated coefficient for the beta factor remained statistically significant.

7.5 Chinese stock market performance and international macroeconomic movements

This section discusses the empirical analysis to determine whether there is a connection between international macroeconomic movements and the stock price performance of companies listed in the SSE. Column (1) in Table 5 presents the regression results with the GDP of US, UK, EU and Japan as the explanatory variables. The results indicate that, except for UK, the GDP for the countries are statistically significant at the 1% level. On average, the GDP for US and Japan have a pro-cyclical relationship with the stock prices of companies listed in the SSE. On the other hand, and on average, the GDP for EU and UK have a counter-cyclical relationship with the SSE-listed companies.

Column (2) in Table 5 present the results with the exchange rates as the explanatory variables. All four coefficients are negative and statistically significant. The results suggest that as the Renminbi appreciates, the stock prices of companies listed in the SSE decreases. Take the case of the Renminbi to US dollar exchange rate. On average, as the Renminbi to US dollar exchange rate appreciates by 1 percentage point, the stock price decreases by 0.366 percentage points. These results are consistent with the goods market theory. According to the goods market theory, the appreciation of the Renminbi should hurt Chinese exporters; and therefore, the shares of such companies would become less desirable and affect the share market in an export-orientated country (Tian and Ma, 2010).

Column (3) in Table 5 present the results with the Dow, Nikkei, and Dax composite indices as the main explanatory variables. The results show that the Dow and Nikkei are statistically significant in explaining stock prices in companies listed in the SSE. The Dow composite estimate is negative which suggests that a one percentage increase in the Dow decreases the average stock price of SSE-listed companies by 2 percentage points. On the other hand, as the Nikkei composite increases by one percentage point, the average stock price in the SSE increases by 1 .7 percentage points.

Finally, column (4) shows the results of the regression where variables from columns (1)-(3) are included in one regression model. The signs of the estimated coefficients remained the same while some variables lost their statistical significance. Throughout these regressions, the R squared is very low at around 14%, which suggests that 14% of the variation in the stock price for companies listed in the SSE is explained by spillovers from other major markets.

Table 5: International macroeconomic movements and stock market performance.

	(1)	(2)	(3)	(4)
US GDP	9.513***			8.392***
	(0.908)			(1.676)
UK GDP	-4.411**			-9.056***
	(1.474)			(2.248)
EU GDP	-13.80***			-15.64***
	(1.873)			(2.593)
Japan GDP	12.85***			3.406**
	(0.618)			(1.230)
Renminbi to US Dollar		-0.366***		1.527
		(0.202)		(0.407)
Renminbi to Euro		-1.975***		-1.246***
		(0.118)		(0.206)
Renminbi to Pound		-0.365**		-0.477**
		(0.114)		(0.183)
Renminbi to Yen		-0.306**		-0.139
		(0.102)		(0.139)
Dow			-2.018***	-0.140
			(0.0663)	(0.193)
Nikkei			1.705***	0.894***
			(0.0656)	(0.141)
Dax			0.140	-0.118
			(0.0850)	(0.123)
Constant	6.562	-1.067	-7.679***	210.3***
	(32.56)	(0.631)	(0.318)	(37.82)
Industry fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Number of observations	55,773	57,083	56,605	54,010
R squared	0.135	0.142	0.137	0.144

Notes: Standard errors in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%.

8. SUMMARY AND CONCLUSION

Along with its impressive economic growth, the stock markets in China (Shanghai, Shenzhen, and Hong Kong) have rapidly developed in recent years. The stock markets are an important part of China's economic growth and has become increasingly accessible to international investors. Naturally, understanding the economic forces and individual firm characteristics driving stock price movements in this market have become increasingly important.

One of the objectives of this study was to test the applicability of the CAPM using monthly stock returns of the companies listed at the SSE from January 2013 to February 2018. The sample size was 1,406 companies which were also the constituent companies for the SSE composite index during the period under study. From the results of the study it can be concluded that risk and return trade-off is significant in making one’s investment decision since high (low) risk is compensated by high (low) returns. One of the strategies investors make to diversify away most of the firm specific part of the returns is to create portfolios. The securities, therefore, were combined into 150 portfolios each comprising about 8 to 9 companies. The CAPM was tested by running a cross section regression of the portfolio expected return and the portfolio betas. The results showed that the beta coefficient was significant. Moreover, there is evidence to support the linear relationship between the portfolio betas and expected return. These findings are therefore in harmony with the CAPM principles.

Another objective of this study is to provide an econometric analysis of stock returns for firms listed in the SSE. This study finds that exchange rates and composite indices of other major markets (US, Euro zone, Japan and UJ) are important determinants of stock returns for SSE firms. Moreover, it was found that business cycles in other countries are important determinants of stock returns for firms listed in the SSE.

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