



Queensland University of Technology

**DISCUSSION PAPERS IN ECONOMICS, FINANCE AND  
INTERNATIONAL COMPETITIVENESS**

**Is Idiosyncratic Volatility Priced? Evidence from the  
Shanghai Stock Exchange**

**Michael E. Drew, Tony Naughton, and  
Madhu Veeraraghavan**

ISSN 1324-5910

**All correspondence to:**

Associate Professor Andrew Worthington  
Editor, *Discussion Papers in Economic, Finance and International  
Competitiveness*  
School of Economics and Finance  
Queensland University of Technology  
GPO Box 2434, BRISBANE QLD 4001, Australia

Telephone: 61 7 3864 2658  
Facsimilie: 61 7 3864 1500  
Email: [a.worthington@qut.edu.au](mailto:a.worthington@qut.edu.au)

**Discussion Paper No. 138, February 2003**

**Series edited by  
Associate Professor Andrew Worthington**

---

**School of Economics and Finance**



# Is Idiosyncratic Volatility Priced? Evidence from the Shanghai Stock Exchange

Michael E. Drew<sup>a</sup> Tony Naughton<sup>b</sup> and Madhu Veeraraghavan<sup>c\*</sup>

<sup>a</sup> School of Economics and Finance, Queensland University of Technology, GPO Box 2434, Brisbane, Queensland, 4001, Australia.

<sup>b</sup> School of Accounting and Finance, Griffith University, PMB 50 Gold Coast Mail Centre, Gold Coast, Queensland, 9726, Australia.

<sup>c</sup> Department of Accounting and Finance, The University of Auckland, Private Bag 92019, Auckland, New Zealand.

---

## Abstract

This paper employs the mimicking portfolio approach of Fama and French (1996) and asks whether idiosyncratic volatility is priced. This paper also provides evidence on whether returns on small stocks are higher in January than in remaining months. Our findings reveal that (a) idiosyncratic volatility is priced; and, (b) the multifactor model provides a better description of average returns than the traditional CAPM. We also find that the absolute pricing errors of the CAPM are large when compared with the multifactor model. We argue that firm size and idiosyncratic volatility may serve as proxies for systematic risk. We also dismiss the claim that returns on small stocks are on average higher in January than in remaining months. In summary, investors interested in taking additional risks should invest in small and low idiosyncratic volatility firms in addition to the market portfolio. This is because our findings indicate that investors can generate substantial returns by investing in strategies unrelated to market movements.

**JEL Classification:** G110, G120, G150

**Keywords:** Idiosyncratic Volatility, Firm Size, Asset Pricing, China.

January 2003

---

## 1. Introduction

In an informationally efficient stock market future payoffs on assets cannot be predicted on the basis of available information. At least thirty years ago financial economists believed that this assumption was true since information on stocks would be fully reflected in their current prices. Fama (1991) states that market efficiency implies that returns are unpredictable from past returns or past variables and the best forecast of a return is its historical mean. Now, almost everyone agrees that stock returns are at least partly predictable (see, Fama 1991).

In a related vein, Cochrane (1999) states, "*We once thought that stock and bond returns are essentially unpredictable. Now we recognize that stock and bond returns have a substantial predictable component at long horizons.*" [p.36]. Evidence suggests that variables such as dividend / price ratio, book-to-market equity ratio and firm size can predict stock returns. More recent work demonstrates that idiosyncratic volatility can predict substantial amounts of variation in average stock returns (see, for example, Malkiel and Xu 1997).

---

\* Correspondence: E-mail: T.Naughton@mailbox.gu.edu.au; Tel: 61-7-5552-8015; Fax: 61-7-5552-8068. We thank Pavlo Taranenko for excellent research assistance. Drew is grateful to the Economic Society of Australia (Qld) Inc. for financial support. Veeraraghavan thanks the School of Accounting and Finance, Research Grant Scheme, for financial support. All remaining errors are ours.

Malkiel and Xu's (1997) findings are naturally controversial since the traditional Capital Asset Pricing Model [hereafter CAPM] states that the market portfolio is efficient and that excess returns on assets must be linearly related to the market betas<sup>1</sup> of Sharpe (1964), Lintner (1965) and Black (1972). The mean-variance efficiency implies that beta risk is the only risk needed to explain expected returns and that there is positive expected premium for beta risk. However, since the seminal work of Sharpe (1964) and others many studies published in the recent past (last 10 to 15 years) have discovered at least one additional variable other than the beta of a security that can be related to average security returns. Cochrane (1999) states *"We once thought that the (CAPM) provided good description of why average returns on some stocks, portfolios, funds or strategies were higher than others. Now we recognize that the average returns of many investment opportunities cannot be explained by the CAPM and "multifactor models are used in its place."* [p. 36].

In a series of papers, Fama and French [hereafter FF] (1992, 1993, 1995, 1996 and 1998) suggest that an overall market factor, firm size and book to market equity help explain the variation in average stock returns better than the CAPM. FF (1996) report that their three-factor model captures most of the average-return anomalies missed by the traditional CAPM. They note that the existence of a beta premium cannot save the CAPM since beta alone cannot explain expected returns. In essence, the current consensus in the finance literature is that firm size and book-to-market equity factors are pervasive risk factors besides the overall market factor<sup>2</sup>.

Malkiel and Xu's (1997) work represent an interesting new phase in the asset pricing debate. In essence they asked the question: "Is idiosyncratic volatility related to stock returns?" Their contribution was controversial since the evidence suggested that idiosyncratic volatility<sup>3</sup> is related to returns from individual stocks. Their findings violate the basic prediction of the CAPM which states that expected rates of return across all risky assets is a linear function of the market beta. They also note that idiosyncratic volatility is highly correlated with firm size and that it plays a significant role in explaining the cross-section of expected returns. Malkiel and Xu (1997) also challenge the efficient market hypothesis framework, which argues that only systematic risk should be priced in the market, and be deserving of a risk premium. In a later paper, Malkiel and Xu (2000) suggest that idiosyncratic volatility will affect asset returns when not every investor is able to hold the market portfolio. They state that if one group of investors are unlikely to hold the market portfolio, because of exogenous reasons, the remaining investors will also not be able to hold the market portfolio.

Hence, they suggest that idiosyncratic volatility could be priced to compensate rational investors for an inability to hold the market portfolio. They also observe that, even after controlling for firm size and book to market equity, idiosyncratic volatility is more powerful in explaining the cross-section of expected returns. Campbell et al (2001) find a noticeable increase in firm-level volatility relative to market volatility. They find that the explanatory power of the market model for an individual stock declines and note that the number of

---

<sup>1</sup> Roll and Ross (1994) state that there is an exact linear relation between expected returns and true betas when the market portfolio lies on the ex-ante mean-variance efficient frontier. However, it is accepted that stock returns are predictable and factors other than the beta can explain the variation in average stock returns suggesting that the index proxy used in mean-variance tests are inefficient. As a possible explanation Roll and Ross (1994) suggest that if the index is inefficient, the ex-ante cross-sectional relation does not hold and hence other variables can have explanatory power.

<sup>2</sup> See Banz (1981), Basu (1983), Berk (2000), Campbell et al (2001), Daniel and Titman (1997), Daniel, Titman and Wei (2001), Davis, Fama and French (2000), Fama and French (1992, 1993, 1995, 1996 and 1998), French, Schwert and Stambaugh (1987), Liew and Vassalou (2000), Malkiel and Xu (1997, 2000 and 2001), Narasimhan and Titman (1993), Pastor and Stambaugh (2000) and Rosenberg, Reid and Lanstein (1985). For evidence from Asian markets see, Drew and Veeraraghavan (2001, 2002a and 2002b) and Drew, Naughton and Veeraraghavan (2002).

<sup>3</sup> Also, see Douglas (1969) and Lintner (1965). They find that the variance of the residuals from a market model explains the variation in stock returns.

stocks required to achieve a given level of diversification increases. They report that a well-diversified portfolio must have at least 40 stocks to achieve the given level of diversification.

Hamao, Mei and Xu (2002) state that the role of idiosyncratic risk in asset pricing has largely been ignored since standard finance theory argues that only systematic risk should be priced in the market. In a related vein, Xu and Malkiel (2003) state that the behavior of idiosyncratic volatility has received far less attention in the finance literature. Again, this is because idiosyncratic volatility can be eliminated in a well-diversified portfolio. However, Barber and Odean (2000) and Benartzi and Thaler (2001) find that both individual investors' portfolios and mutual fund portfolios are undiversified. Goyal and Santa-Clara (2001) argue that the lack of diversification suggests that the relevant measure of risk for many investors may be the total risk. It is to be noted that little, if any, has been published on whether idiosyncratic volatility can explain the cross section of expected stock returns<sup>4</sup>. We begin to fill the void in the literature by investigating the explanatory power of an overall market factor, firm size and idiosyncratic volatility for equities listed in the Shanghai Stock Exchange. We are interested in studying the role of idiosyncratic risk in asset pricing for three reasons:

(a) Standard finance theory states that the CAPM must hold if all investors hold a combination of the market portfolio and a risk-free asset. It is now widely accepted that this assumption<sup>5</sup> is often violated. Malkiel and Xu (2000) state that when constrained investors are unable to hold the market portfolio, unconstrained investors will also be unable to hold the market portfolio. They also state that if investors are unable to hold the market portfolio they will be forced to think about total risk and not simply the systematic or market risk.

(b) Kang et al (2002) state that China is one of the few countries whose stock markets are negatively correlated with that of United States and hence attracts attention from global investors. Hence, we argue that investigating the role of firm size and idiosyncratic volatility in asset pricing is not only important for academic researchers in the area of risk measurement but also for multifactor mean-variance efficient investors.

(c) Standard finance theory further argues that only systematic risk should be priced in the market and that idiosyncratic risks should not be related to stock returns. Our objective is to determine if idiosyncratic volatility is priced. That is, we investigate whether investors are compensated for taking high idiosyncratic risks. We investigate this by using the mimicking portfolio approach of Fama and French (1996). The central objectives of this paper are twofold: First, the paper investigates the robustness of a multifactor model incorporating idiosyncratic volatility as an explanatory variable. Our objective is to determine whether such a model can explain the variation in average returns better than the CAPM. Second, we investigate whether the multifactor model findings can be explained by January or Chinese New Year effects. We ask this question since it is well documented that stock returns especially returns on small stocks tend to be higher in January than in the rest of the year (see, for example, Rozeff and Kinney (1981), Reinganum (1983), Keim (1983), Gultekin and Gultekin (1983) and Aggarwal and Rivoli (1989)).

The paper is further motivated by the challenges of working with Chinese data. These challenges are summarised in the discussion of the institutional setting in Section 2. The prior work on idiosyncratic volatility discussed above relates to the US markets. Recent work by Drew and Veeraraghavan (2002b) has investigated the role of idiosyncratic volatility in asset pricing for Hong Kong, India, Malaysia and Philippines. We view the Shanghai stock

<sup>4</sup> See, Malkiel and Xu (1997, 2000) and Drew and Veeraraghavan (2002b). Drew and Veeraraghavan (2002b) investigate the role of idiosyncratic volatility in asset pricing for Hong Kong, India, Malaysia and Philippines. They find that small and high idiosyncratic volatility firms generate superior returns and hence argue that such firms carry risk premia.

<sup>5</sup> Malkiel and Xu (2000) cite transaction costs, liquidity constraints and other exogenous factors as possible reasons for the inability to hold the market portfolio.

exchange as an ideal venue to investigate whether the pricing of idiosyncratic volatility can be identified in a market that is widely regarded as lacking sophistication.

Our results are easy to summarize. The major result of this paper is that the overall market factor alone is not sufficient to explain the variation in the cross-section of average stock returns in China. Our analysis shows that (a) the mimic portfolio for size, SMB, generates a positive return of 0.76 per cent per month suggesting that small firms are riskier than big firms; and, (b) the mimic portfolio for idiosyncratic volatility, HIVMLIV, generates a return of – 0.58 per cent per month suggesting that high idiosyncratic volatility firms are not riskier than low idiosyncratic volatility firms. In response to our second research question our analysis reveals that the multifactor model findings cannot be explained either by January or Chinese New Year effects. The rest of the paper is organized as follows. In the following section a brief discussion on China's stock markets are presented. Section 3 presents the data and methodology while Section 4 presents the findings. Section 5 concludes the paper.

## 2. The Institutional Setting

The Shanghai stock market reopened at the beginning of the 1990s and together with the Shenzhen stock market has grown from a handful of listed firms to over 1100 listed firms as of 2001 (see Figure 1.0). Similarly, the market capitalization has grown from 2.2 billion Renminbi (US\$0.28 billion) to over 4800 billion Renminbi as of 2001 (see Figure 2.0). On average capitalisation growth has been 153% per annum since reopening, despite negative growth of 5.5% during the turbulent 1995 year. Much of this growth has been attributable to the steady flow of new listings. At this rate it will be one of the largest markets in the region when the planned unification of the Shanghai and Shenzhen stock exchanges takes place.

Figure 1.0  
Number of Listed Companies

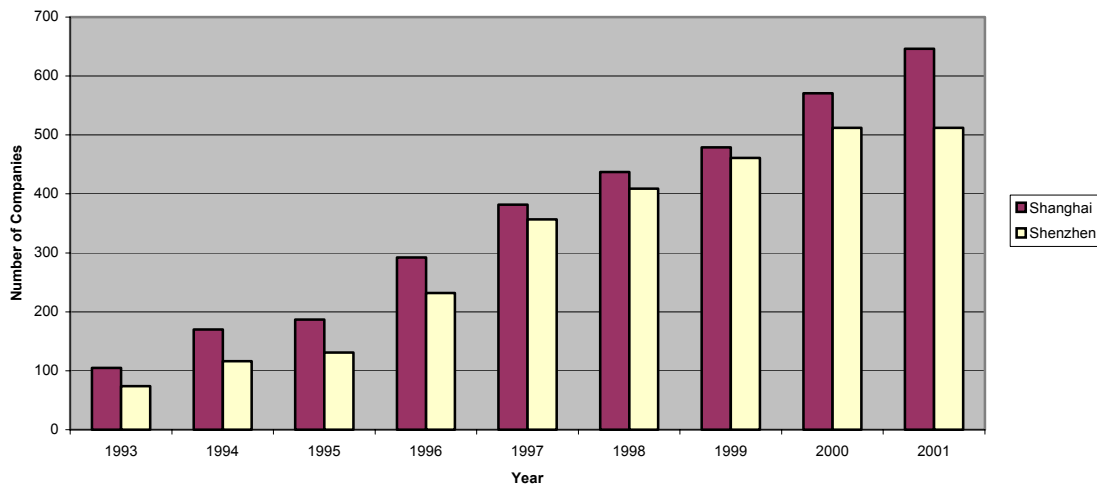
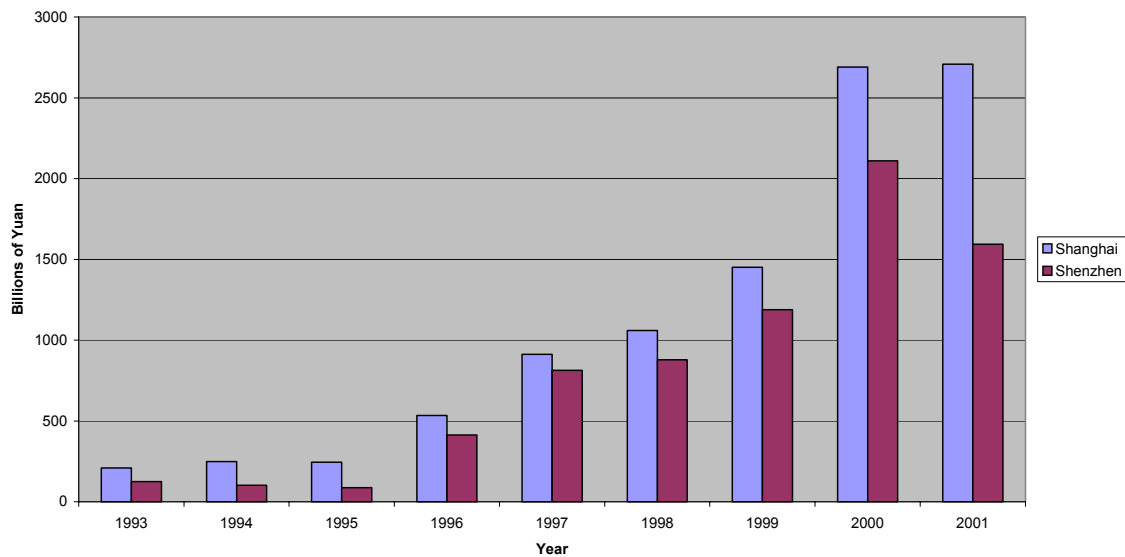


Figure 2.0  
Market Capitalization



In the region of 60 million investors own shares in China with an almost total absence of domestic institutional trading. While domestic institutional ownership represents 21% of market capitalisation (Naughton and Hovey, 2002), these holdings are not tradeable and are primarily held by state controlled investment trusts. The most significant holding at 38% of market capitalisation is direct ownership by the state, which is again a non-tradeable category. The popularity of the market to retail investors is primarily driven by a lack of alternative investment opportunities. There is a widely held view that the lack of sophistication of investors leads them to rely heavily on rumour for information and the market is momentum driven.

While there is an abundance of anecdotal evidence to support this proposition, there remains a lack of clear empirical evidence in this regard. However, in an attempt to combat this concern this paper deals only with the Shanghai stock exchange. Shanghai is the larger of the two markets with on average larger listed firms and a more sophisticated market structure. However, tackling empirical research in stock returns in China remains a challenge. The emerging empirical literature suggests the Chinese market displays some unusual characteristics. Much of the literature has focused on the segmentation of the market and mispricing between A shares, denominated in domestic currency, and B shares, traded in foreign currency (see, for example, Sun and Tong, 2000 and Lee, Chen and Rui, 2001). However, this anomaly has been significantly reduced following the opening of the B market to domestic investors in 2001, although it persisted throughout most of the period of this study.

The ability of investors to profit from contrarian strategies is documented by Kang, Liu and Ni (2002) and is attributed to persistent overreaction to firm-specific information. Lee, Chen and Rui (2001) document both a lack of a random walk in stock returns and highly persistent volatility. In terms of asset pricing models, Sun and Tong (2000) find some empirical support for both a traditional CAPM and the intertemporal CAPM when controlling for market segmentation. However, Drew, Naughton and Veeraraghavan (2002) (henceforth DNV) find that a multifactor model provides a superior cross-sectional explanation of stock returns in Shanghai. Contrary to the prevailing international evidence, DNV report a growth premium rather than a value premium for Shanghai stocks. At this point in time there is no evidence of research tackling the issue of idiosyncratic volatility. This paper therefore represents the first attempt at exploring this issue in China.

### 3. Data and Methodology

#### A. The multifactor model

Monthly stock returns and market values of all firms listed in the Shanghai stock exchange covering the period December 1993 to December 2000 were obtained from the Great China Database maintained by the Taiwan Economic Journal. Our basic model investigates the relationship between the expected return of a certain portfolio, and the overall market factor, firm size and idiosyncratic volatility by employing the following model:

$$R_{pt} - R_{ft} = a_{pt} + b_p (R_{mt} - R_{ft}) + s_p \text{SMB}_t + h_p \text{HIVMLIV}_t + \varepsilon_{it} \quad [1]$$

$R_{pt}$  is the average return of a certain portfolio (S/L, S/M, S/H; B/L, B/M and B/H)<sup>6</sup>.  $R_{ft}$  is the one-year time deposit rate observed at the beginning of each month. Market, is long the market portfolio and short the risk free asset; SMB, is long small capitalization stocks and short large capitalization stocks; HIVMLIV, is long high idiosyncratic volatility stocks and short low idiosyncratic volatility stocks. The factor loadings  $b_p$ ,  $s_p$  and  $h_p$  are the slopes in the time-series regression.

#### B. Methodology

In this paper we follow the mimicking portfolio approach of FF (1996) in forming portfolios on firm size and idiosyncratic volatility. Under the mimicking portfolio approach all firms are ranked according to the variable of interest. The variables of interest are firm size and idiosyncratic volatility. We study idiosyncratic volatility since Malkiel and Xu (1997 and 2000) and Xu and Malkiel (2003) suggest that idiosyncratic volatility may be relevant for asset pricing and that it may serve as a useful proxy for systematic risk. Malkiel and Xu (1997 and 2000) find that the portfolio with the highest idiosyncratic volatility generates superior returns. Xu and Malkiel (2003) show that when the total volatility of individual stocks is decomposed into systematic and idiosyncratic volatility, the idiosyncratic volatility of individual stocks have increased over the decades of the 1980s and 1990s.

#### Constructing Size Portfolios

At the end of December of each year  $t$  stocks are assigned to two portfolios of size (Small or Big) based on whether their December market equity (ME) [defined as the product of the closing price times number of shares outstanding] is above or below the median ME. We form portfolios as of December of each year since most firms in China have December as fiscal year end.

#### Constructing Idiosyncratic Volatility Portfolios

In an independent sort the same stocks are allocated to three idiosyncratic volatility portfolios (Low, Medium, and High) based on the breakpoints for the bottom 33.33 percent and top 66.67 percent. We first compute the variance of returns for each stock in the sample. We define the variance of returns as the total risk of a stock. We then estimate the beta for each stock by using the covariance / variance approach. We define systematic risk as the beta of a stock multiplied by the variance of the index. The idiosyncratic volatility is defined

---

<sup>6</sup> S/L Portfolio = Small firms with low idiosyncratic volatility  
 S/M Portfolio = Small firms with medium idiosyncratic volatility  
 S/H Portfolio = Small firms with high idiosyncratic volatility  
 B/L Portfolio = Big firms with low idiosyncratic volatility  
 B/M Portfolio = Big firms with medium idiosyncratic volatility  
 B/H Portfolio = Big firms with high idiosyncratic volatility



as the difference between total risk and the systematic risk of a stock. We require the previous 24 months of average returns to calculate the variance or beta of the stock<sup>7</sup>.

Stocks that do not have 24 months of continuous returns are excluded from the sample. Similarly, we use the previous 24 months of market returns to calculate the variance of the index. Following the mimicking portfolio approach of FF (1996) we form the intersection and zero investment portfolios. We construct six size-idiosyncratic volatility portfolios and three zero investment portfolios formed at the intersection of the two size and three idiosyncratic volatility portfolios.

### **Constructing Intersection and Zero Investment Portfolios**

The six intersection portfolios formed are (S/L, S/M, and S/H; B/L, B/M, and B/H). The three zero investment portfolios are RMRFT, SMB and HIVMLIV. We define the three zero investment portfolios **RMRFT**, **SMB**, and **HIVMLIV** as follows: **RMRFT** is long the overall market portfolio and short the risk free asset. **SMB** (Small minus Big) is the difference each month between the average of the returns of the three small stock portfolios (S/L, S/M, and S/H) and the average of the returns of the three big portfolios (B/L, B/M, and B/H). **HIVMLIV** (High Idiosyncratic Volatility minus Low Idiosyncratic Volatility) is the difference between the average of the returns of the two high idiosyncratic volatility portfolios (S/H, B/H) and the average of the returns on the two low idiosyncratic volatility portfolios (S/L, B/L).

**Table 1**

**Sample Characteristics**  
**Number of companies in portfolios formed on size and idiosyncratic volatility**  
**12/95 to 12/00**

<b>YEAR</b>	<b>S/L</b>	<b>S/M</b>	<b>S/H</b>	<b>B/L</b>	<b>B/M</b>	<b>B/H</b>	<b>Total</b>
1995	28	20	12	10	12	16	98
1996	47	30	12	17	40	32	178
1997	35	47	17	56	51	38	244
1998	54	43	25	50	63	25	260
1999	108	80	36	54	76	69	423
2000	115	97	69	79	99	84	543
<b>AVERAGE</b>	<b>65</b>	<b>53</b>	<b>29</b>	<b>45</b>	<b>57</b>	<b>44</b>	<b>293</b>

Table 1, shows the average number of companies in each portfolio for the sample period. This table shows that the small cap – low idiosyncratic volatility portfolio has an average of 65 companies per portfolio sort followed by the big cap – medium idiosyncratic volatility portfolio with an average of 57 companies. The table also shows that the small cap – medium idiosyncratic volatility portfolio, big cap – low idiosyncratic volatility portfolio, big cap – high idiosyncratic volatility portfolio and the small cap – high idiosyncratic volatility have an average of 53, 45, 44 and 29 companies respectively.

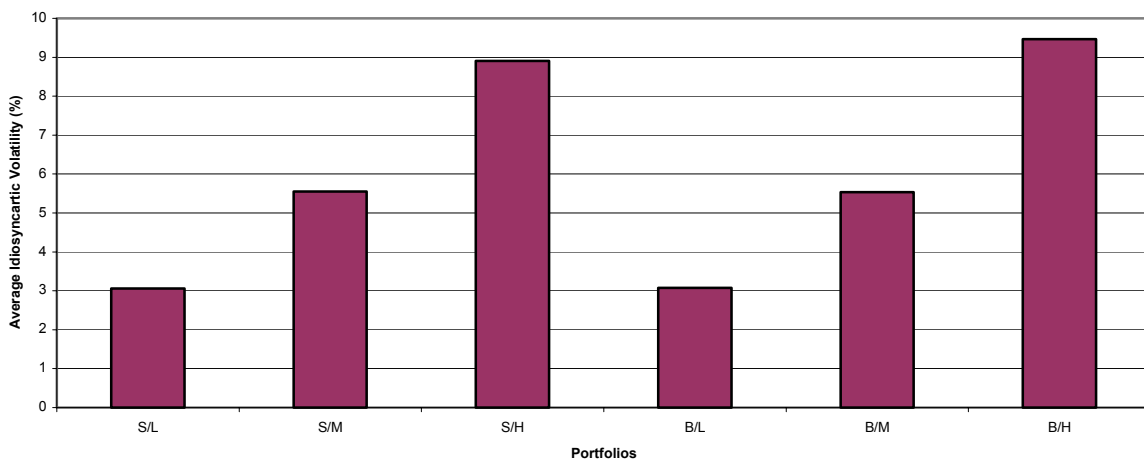
<sup>7</sup> Assume that we want to calculate the variance of the stock as of January 1995. We require the previous 24 months of sample returns in order to calculate the variance.

**Table 2****Average Idiosyncratic Volatility (%) for portfolios on size and idiosyncratic volatility  
12/95 to 12/00**

YEAR	S/L	S/M	S/H	B/L	B/M	B/H
1995	2.1394	6.1534	9.0110	2.2305	6.0259	8.9702
1996	2.0134	4.2320	6.1636	2.4076	4.2855	7.1244
1997	3.6159	5.6024	8.9665	3.1902	5.7237	9.9656
1998	4.5304	6.8007	11.2597	4.1495	6.8908	12.6574
1999	3.5231	6.0539	10.1715	3.8379	6.0666	9.4582
2000	2.5110	4.4441	7.8656	2.6364	4.2349	8.6259
<b>AVERAGE</b>	<b>3.0555</b>	<b>5.5477</b>	<b>8.9063</b>	<b>3.0753</b>	<b>5.5379</b>	<b>9.4669</b>

Table 2, shows the average idiosyncratic volatility for the six intersection portfolios. This table shows that (B/H and S/H) portfolios have an average idiosyncratic volatility of 9.46 and 8.90 percent respectively, followed by (S/M and B/M) portfolios, with an average of 5.54 and 5.53 percent respectively. The table also shows that (B/L and S/L) have an average of 3.07 and 3.05 percent respectively. It is interesting to note that out of the three small stock portfolios (S/H) portfolio has the lowest number of firms (29) but has the highest average idiosyncratic volatility (8.90 percent). Note that (S/L) portfolio has the highest number of firms (65) but has the lowest average idiosyncratic volatility (3.05 percent). Similarly, out of the three big stock portfolios (B/H) has the lowest number of firms (44) but has the highest idiosyncratic volatility (9.46 percent). It is also to be noted that the (B/L) portfolio has (45) firms but has the lowest idiosyncratic volatility (3.07 percent).

**Figure 3.0**  
**Average Idiosyncratic Volatility of Intersection Portfolios**  
**12/95 to 12/00**



## 4. Empirical Results

### A. Overall performance of the intersection portfolios

In this section we present the returns for the three zero investment portfolios and in Table 3 Panel A the returns for our six intersection portfolios. We then examine the results of our regressions in Table 3 Panel B.

Our first research question investigates whether a multifactor asset-pricing model largely explains the cross-section of average stock returns<sup>8</sup>. Specifically, we ask whether an overall market factor, firm size and idiosyncratic volatility can explain the cross-sectional pattern of stock returns better than the CAPM. Our tests show that the overall market factor, RMRFT, generates a return of 2.18 per cent per month or 26.16 per cent per annum, while the mimic portfolios for firm size, SMB, and idiosyncratic volatility, HIVMLIV, generate a return of 0.76 (standard deviation = 3.37) and -0.58 (standard deviation = 6.58) per cent per month or 9.12 and -6.96 per cent per annum respectively.

**Table 3**  
**Summary Statistics and Multifactor Regressions for Portfolios Formed on Size and Idiosyncratic Volatility**

Summary Statistics						
Idiosyncratic Volatility Portfolios						
Size	Low	Medium	High	Low	Medium	High
Panel A: Summary Statistics						
	<u>Means</u>			<u>Standard Deviations (<math>C_V</math>)<sup>9</sup></u>		
Small	3.3661	2.6001	2.2823	12.5651 (3.73)	9.3550 (3.59)	9.8576 (4.31)
Big	1.9787	2.0775	1.8860	11.5603 (5.84)	9.7818 (4.70)	10.2403 (5.42)

Table 3, Panel A reports the average excess returns on the six size-to-idiosyncratic volatility sorted portfolios for China. The table shows that the three small stock portfolios (S/L, S/M and S/H) generate higher returns than the three big stock (B/L, B/M and B/H) portfolios. This is summarized in figure 4.0. We also find that the three small stock portfolios have a lower coefficient of variation than the three big stock portfolios. For example, (S/M) portfolio has the lowest coefficient of variation of 3.59 per cent while the (B/H) portfolio has the highest coefficient of variation of 5.42 per cent. This suggests that investors can improve their risk-return profile by simply investing in the three small stock portfolios.

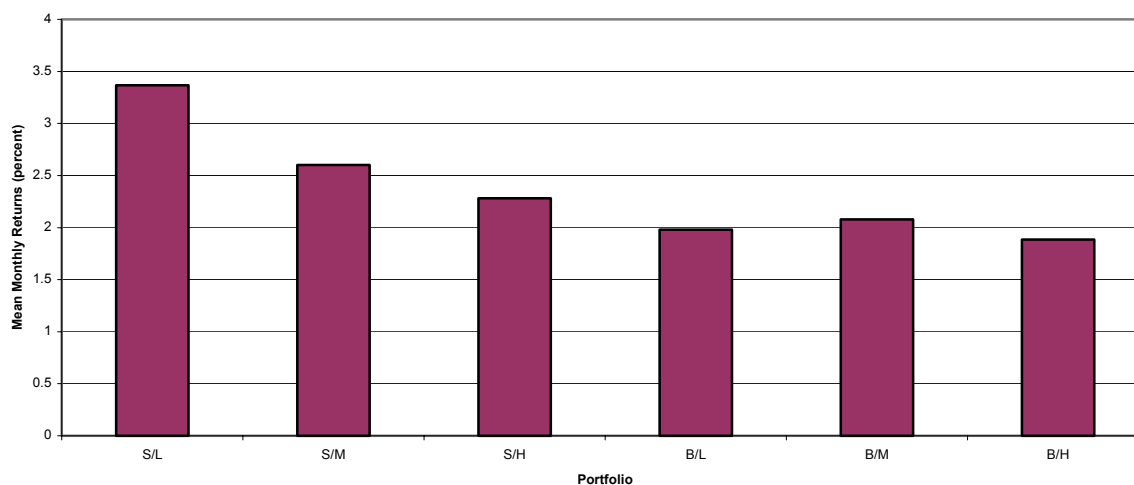
<sup>8</sup> We also conducted tests of the CAPM in which we used  $R_{mt}-R_{ft}$  alone to explain stock returns. We found that the absolute pricing errors, measured by the intercept, of the CAPM, are quite large when compared with the intercept of the multifactor asset-pricing model. The average intercept of the CAPM was 0.62 while the average intercept of the multifactor model was 0.32. In essence, we find that the absolute pricing errors of the CAPM are close to two times the multifactor model. Hence, we suggest that the multifactor model dominates the one factor CAPM.

<sup>9</sup> We calculate the coefficient of variation, a measure of relative dispersion, since it is useful for comparing the risk of portfolios with differing expected returns. Coefficient of variation can be expressed as

$$C_V = \frac{\sigma_k}{\bar{k}}$$

The higher the coefficient of variation, greater the risk.

**Figure 4.0**  
**Excess Returns of Intersection Portfolios**



Since, the zero investment portfolio for size, SMB, generates a positive return we suggest that small stocks are riskier than big stocks. Our findings are consistent with FF (1996) and others who document a small firm effect. Note, that the zero investment portfolio for idiosyncratic volatility, HIVMLIV, generates a negative return of  $-0.58$  per cent per month. This suggests that overall the market views high idiosyncratic volatility stocks as less risky than low idiosyncratic volatility stocks. Similar work conducted by Drew and Veeraraghavan (2002b) find that the two zero investment portfolios (SMB and HIVMLIV), generate positive returns<sup>10</sup> for Hong Kong, India, Malaysia and Philippines. That is, they find that small and high idiosyncratic volatility firms generate superior returns than big and low idiosyncratic volatility firms. The results here present a challenge in terms of interpretation.

Interestingly, for China the zero investment portfolio for idiosyncratic volatility generates negative returns. In another paper, DNV (2002) investigate the explanatory power of an overall market factor, firm size and book-to-market equity for equities listed on the Shanghai Stock Exchange. They find that the mimic portfolio for size, SMB, generates a return of 0.92 per cent per month or 11.04 per cent per year, while the mimic portfolio for book-to-market equity, HML, generates a return of  $-0.20$  per cent per month or  $-2.40$  per cent per year. It is interesting to note that investors in China perceive low book-to-market and low idiosyncratic volatility firms as riskier firms and therefore expect higher returns for investing in firms with such characteristics while, evidence from other Asian markets show otherwise (see, Drew and Veeraraghavan 2001).

<sup>10</sup> For Hong Kong, the zero investment portfolios for size and idiosyncratic volatility generate a return of 0.1475 and 0.4994 per cent per month or 1.77 and 5.99 per cent per annum respectively. For India, the two portfolios generate a return of 0.50 and 0.59 per cent per month or 6.00 and 7.08 per cent per annum respectively. For Malaysia, the two portfolios generate a return of 0.50 and 0.73 per cent per month or 6.00 and 8.76 per cent per annum respectively. Finally, for Philippines the two portfolios generate a return of 5.46 and 0.58 per cent per month or 65.52 and 6.96 per cent per annum respectively.

**Table 3 - Continued**  
**Multifactor Regressions for Portfolios Formed on Size and Idiosyncratic Volatility**  
**Regression Coefficients**

Idiosyncratic Volatility Portfolios						
Size	Low	Medium	High	Low	Medium	High
Panel B: $R_{pt} - R_{ft} = a_{pt} + b_p (R_{mt} - R_{ft}) + s_p \text{SMB}_t + h_p \text{HIVMLIV}_t + \varepsilon_{it}$						
	a			t(a)		
Small	0.422	0.494	0.008	1.234	1.391	0.206
Big	-0.003	0.723	0.308	-0.075	0.308	0.816
	b			t(b)		
Small	0.963	0.847	0.878	30.075	25.498	23.025
Big	0.856	0.890	0.942	22.601	24.863	26.607
	s			t(s)		
Small	0.875	0.753	0.929	8.932	7.407	7.969
Big	-0.007	-0.239	-0.129	-0.648	-2.177	-1.195
	h			t(h)		
Small	-0.278	0.556	0.743	-4.938	9.535	11.097
Big	-0.328	0.698	0.651	-4.938	11.106	10.483
	R <sup>2</sup>			s(e)		
Small	0.95	0.90	0.88	2.77	2.87	3.30
Big	0.91	0.89	0.91	3.28	3.10	3.06
	DW					
Small	1.972	1.916	1.888			
Big	1.996	1.966	1.988			

Table 3, Panel B reports the coefficients of the three-factor model. The results of Panel B show that the intercept, (a coefficient), is statistically indistinguishable from zero for all six portfolios. Our results are consistent with Merton (1973) who notes that standard asset-pricing models produce intercepts that are statistically indistinguishable from zero. Therefore, if the multifactor model is parsimonious and describes expected return in a meaningful manner, the intercepts should be indistinguishable from zero. We also observe that the overall market factor, (b coefficient), is close to one and highly significant at the 1 percent level for all six portfolios. The size factor, (s coefficient), is also positive and highly significant at the 1 per cent level for the three small stock portfolios. The s coefficient is negative for the three big portfolios but significant at the 5 per cent level only for the (S/M) portfolio. Our findings are consistent with that of FF (1996) who state that small firms load positively on SMB while big firms load negatively on SMB.

The idiosyncratic volatility factor, ( $h$  coefficient), increases monotonically for the three small stock portfolios and is significant at the 1 percent level for the three small stock portfolios. That is, the  $h$  coefficient is negative for the (S/L) portfolio but becomes positive and highly significant for (S/M and S/H) portfolios. Similarly, the  $h$  coefficient is negative and significant at the 1-per cent level for the (B/L) portfolio but becomes positive and significant at the 1- per cent level for (B/M and B/H) portfolios. Once again our findings are consistent with FF (1996) who state that high book-to-market equity firms load positively on HML while low book-to-market equity firms load negatively on HML. As far as diagnostics are concerned we do not find any evidence of autocorrelation as the computed  $d$  statistic is greater than the upper bound limit. We therefore, do not reject the null hypothesis of no autocorrelation<sup>11</sup> in the data. We also do not reject the null hypothesis of no multicollinearity<sup>12</sup> in our sample as they do not exist.

### **B. Tests for Turn of the year effect**

Before proceeding to discuss the premia associated with each factor we will examine whether our model is influenced by the turn of the year effect. Tests have focused on the existence of trends arising from seasonal factors such as monthly seasonal, daily seasonal and patterns arising during the course of the day. Fama (1991) states that the most mystifying seasonal is the January effect<sup>13</sup>. Fama (1991) observes that stock returns, especially on small stocks are on average higher in January than in the remaining months. Haugen and Jorion (1996) state that the January effect is arguably the most celebrated of the many stock market anomalies discovered during the past two decades. Malkiel (1999) notes that the January effect is particularly strong for stocks with small market capitalization.

Malkiel (1999) also notes that even after adjusting for risk firms with small market capitalization appear to offer investors with superior returns. The superior returns are generally produced during the first few days of the trading year. In essence, evidence indicates that small stocks generate higher returns than large stocks and that most of the small stock premium is generated in the first few trading days in January. Roll (1983) and Keim (1983) document that returns on small stocks tend to be higher in January than in non-January months. Keim (1983) found that almost half of the annual size premium to small firms occurs in January. This has since been termed as the turn of the year effect. FF (1993) state that it is now standard in tests of asset-pricing models to look for unexplained January effects. Therefore, a natural extension to the size effect is to examine whether it displays monthly seasonality. Since, our second research question is to investigate whether the multifactor model findings are driven by seasonal influences we test for the seasonality effect by employing the following model:

$$R_{pt} - R_{ft} = a_{pt} + b_p (R_{mt} - R_{ft}) + s_p \text{SMB}_t + h_p \text{HIVMLIV}_t + \gamma_p \text{Jan}_t + \theta_p \text{Feb}_t + \varepsilon_{it} \quad [2]$$

In this model we introduce a dummy for the January effect that is 1 in January and 0 in other months. Similarly, we test for the Chinese New Year effect by introducing a dummy for the

<sup>11</sup> We use the DW test for detecting autocorrelation. We find no evidence of autocorrelation, as the calculated  $d$  statistic is greater than the upper bound limit for all six portfolios. The test is conducted at the 1 per cent level of significance.

<sup>12</sup> The Belsley, Kuh and Welsch (1980) approach is used to test for multicollinearity. We use the condition index and the variance inflation factors to detect multicollinearity. Condition index is defined as the square root of the ratio of the largest eigenvalue to each individual eigenvalue. It is suggested that if the condition index is between 10 and 30, then there is moderate to strong multicollinearity and if the index exceeds 30 then there is severe multicollinearity. If the condition index is below 10, multicollinearity is said to be absent.

<sup>13</sup> See Rozeff and Kinney (1976), Branch (1977), Dyl (1977), Keim (1983, 1985 and 1986), Keim and Stambaugh (1986), Brailsford and Easton (1991), Brown, Keim, Kleidon and Marsh (1983) and Kato and Shallheim (1985) for a discussion on January effect.

Chinese New Year effect (February effect) that is 1 in February and 0 in other months. Evidence of a Chinese New year effect has been documented in the Asian region by Ho (1990) and Tong (1992).

**Table 4**  
**Multifactor Model Tests for January and Chinese New Year Effect**

Idiosyncratic Volatility Portfolios						
Size	Low	Medium	High	Low	Medium	High
Panel B: $R_{pt} - R_{ft} = a_{pt} + b_p (R_{mt} - R_{ft}) + s_p \text{SMB}_t + h_p \text{HML}_t + \gamma_p \text{Jan}_t + \theta_p \text{Feb}_t + \varepsilon_{it}$						
	a			t(a)		
Small	0.174	0.411	-0.001	0.464	1.036	-0.024
Big	-0.162	0.174	0.002	-0.360	1.665	0.055
	b			t(b)		
Small	0.964	0.847	0.878	30.233	25.181	22.752
Big	0.856	0.890	0.942	22.391	24.480	26.800
	s			t(s)		
Small	0.884	0.749	0.921	8.638	6.937	7.444
Big	-0.008	-0.244	-0.120	-0.670	-2.089	-1.062
	h			t(h)		
Small	-0.282	0.554	0.740	-5.039	9.373	10.918
Big	-0.332	0.698	0.646	-4.939	10.919	10.454
	$\gamma$			t( $\gamma$ )		
Small	1.212	0.232	0.180	0.987	0.179	0.121
Big	0.346	-0.009	1.378	0.235	-0.071	1.017
	$\theta$			t( $\theta$ )		
Small	1.630	0.785	1.012	1.367	0.624	0.701
Big	1.279	0.251	1.897	0.895	0.184	1.442
	$R^2$			s(e)		
Small	0.95	0.90	0.88	2.75	2.91	3.33
Big	0.91	0.89	0.91	3.30	3.14	3.04
	DW					
Small	1.864	1.911	1.930			
Big	2.011	1.801	1.857			

Our findings show that the multifactor model findings cannot be explained either by the January or Chinese New Year effects since the coefficients for the January and Chinese New Year effects, ( $\gamma$  and  $\theta$ ), are not statistically significant for any of the six size to idiosyncratic volatility sorted portfolios. Hence, we reject the argument that the multifactor model findings can be explained by the seasonality effect. Table 4, also reports diagnostic measures for the multifactor model. We do not find any evidence of autocorrelation as the computed  $d$  statistic is higher than the upper bound value at the 1-percent level. We also conducted tests to determine the extent of interrelationship between the explanatory variables. This is because interpretation of the multiple factor regression equation rests implicitly on the assumption that the explanatory variables are not interrelated. Once again, our tests do not show any evidence of multicollinearity in the multiple regression models.

### **C. Market, Size and Idiosyncratic Volatility Premium**

In this section we present a discussion on the premia associated with the overall market, firm size and idiosyncratic volatility. Recall that our main objective in this paper is to investigate the robustness of a multifactor model incorporating idiosyncratic volatility as an explanatory variable. That is, we ask whether a multifactor model can explain the variation in average returns better than the CAPM.

**Table 5**

**Market, Size and Idiosyncratic Volatility Premium**

<b>Portfolio</b>	<b>Market Premium (%)</b>	<b>Size premium (%)</b>	<b>Idiosyncratic Volatility Premium (%)</b>
S/L	2.107 (30.075) <sup>14</sup>	0.672 (8.932)	0.163 (-4.938)
S/M	1.853 (25.498)	0.578 (7.407)	-0.327 (9.535)
S/H	1.921 (23.025)	0.714 (7.969)	-0.437 (11.097)
B/L	1.873 (22.601)	-0.005 (-0.648)	0.192 (-4.938)
B/M	1.947 (24.863)	-0.183 (-2.177)	-0.410 (11.106)
B/H	2.061 (26.607)	-0.099 (-1.195)	-0.382 (10.483)

Our findings indicate that market, firm size and idiosyncratic volatility premia are real and pervasive. Table 5, shows that the market premium is positive for all six size-to-idiosyncratic volatility sorted portfolios. We find that the (S/L) portfolio generates the highest market premium of 2.107 percent per month (t-statistic = 30.075) or 25.28 percent per annum. Table 5 also shows that the three small stock portfolios generate positive risk premium while the three big stock portfolios generate negative risk premium. Out of the three small stock portfolios the (S/H) portfolio generates the highest size premium of 0.714 percent per month (t-statistic = 7.969) or 8.56 per cent per annum. We argue that the positive risk premium generated by the mimic portfolio for size, SMB, is a compensation for risk not captured by the CAPM. We also report that our findings are consistent with FF (1996) and Drew and Veeraraghavan (2001, 2002a, 2002b) and DNV (2002) who document a small firm effect.

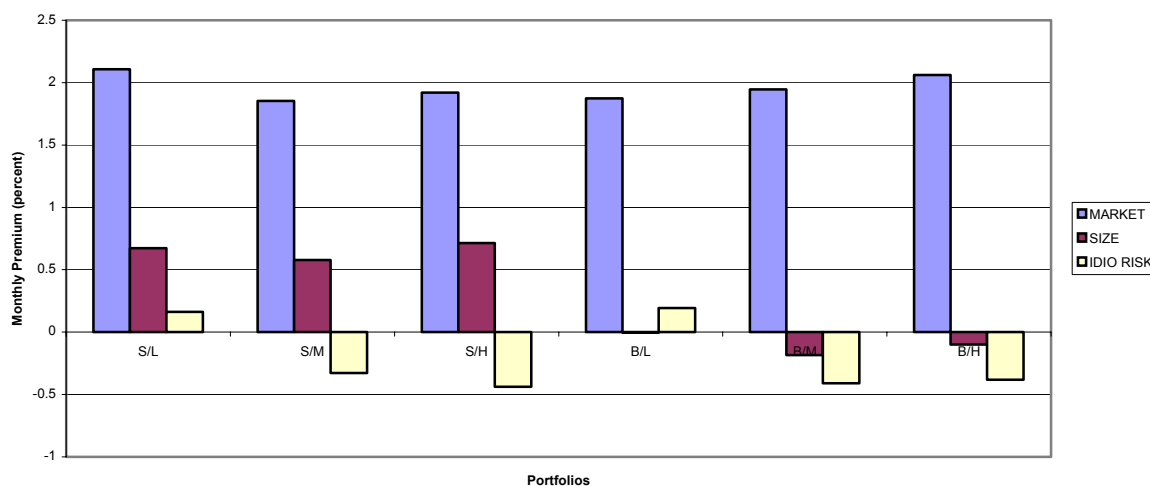
As far as idiosyncratic volatility premium is concerned our findings show that the (S/L) portfolio generates a positive premium while the (S/M and S/H) portfolios generate negative risk premium. Similarly, we find that the (B/L) portfolio generates the highest of 0.192 per cent per month (t-statistic = -4.938) or 2.30 per cent per annum while the (B/M and B/H)

<sup>14</sup> t Statistics of regression coefficients in parentheses



portfolios generate negative risk premium. That is, we find that firms with low idiosyncratic volatility generate superior returns than firms with high idiosyncratic volatility. Therefore, we suggest that investors interested in taking additional risks should invest in small and low idiosyncratic volatility firms in addition to the market portfolio to generate excess returns. We also suggest that investors who are not interested in taking additional risks should simply invest in the market portfolio. This is summarised in figure 5.0.

**Figure 5.0**  
Market, Size and Idiosyncratic Volatility Premia



## 5. Conclusion

The main implication of the CAPM is that in market equilibrium the market portfolio of invested wealth is mean-variance efficient. The CAPM implies that beta is the only risk needed to explain expected returns and that there is a positive risk premium for beta risk. However, an extensive body of literature documents that the market beta is not quite adequate for describing the cross-section of stock returns. In this paper we investigate the robustness of a multifactor model with idiosyncratic volatility as an explanatory variable for equities listed in the Shanghai stock exchange. Our findings suggest that small and low idiosyncratic volatility firms generate superior returns than big and high idiosyncratic volatility firms. This is because the mimic portfolio for size generates a monthly return of 0.76 percent per month or 9.12 per cent per annum while the mimic portfolio for idiosyncratic volatility generates a return of  $-0.58$  percent per month or  $-6.96$  per cent per annum. Hence, we propose that such firms carry a risk premia. When we examine our intersection portfolios the output of our regressions, and the resultant risk premia, confirm these findings. While the size premium follows a well-documented pattern, the idiosyncratic volatility premium does not conform to expectations. Our results suggest that as idiosyncratic volatility increases Chinese investors are prepared to accept a lower risk premium for this factor. This is not the first evidence of apparently irrational, yet systematic, behaviour in the Shanghai stock exchange. As reported above, DNV (2002) report a strong value rather than a growth effect in cross-sectional returns in Shanghai.

Our findings demonstrate that idiosyncratic volatility plays an important role in empirical asset pricing. Therefore, we challenge the CAPM of Sharpe (1964), Lintner (1965) and Black (1972), which, advances the notion that it is rational for a utility maximizing investor to hold a well-diversified portfolio of investments to eliminate idiosyncratic risks. We also report that the absolute pricing errors of the CAPM are quite large when compared with the multifactor model of FF (1996). The major result of this paper is that the CAPM beta alone is not sufficient to describe the variation in average equity returns. Our findings have implications

for multifactor mean-variance efficient investors in the sense that investors can generate superior returns by holding risk factors not related to market movements.

Hence, we argue that investors consider the evidence reported in this paper as it has practical implications for managing portfolios. As far as future research is concerned focus should be on conducting additional empirical tests on the role of idiosyncratic volatility and also determine whether idiosyncratic volatility is relevant in evaluating portfolio performance. The next obvious question is: Do firm size and idiosyncratic volatility represent economically relevant aggregate risk? Otherwise, the two dimensions of risk investigated are arbitrary. This is a worthwhile avenue for future research.

## **References**

- Aggarwal, R., and P. Rivoli, 1989, Seasonal and day of the week effects in four emerging stock markets, *The Financial Review* 24, 541-550.
- Banz, Rolf W., 1981, The relation between return and market value of common stocks, *Journal of Financial Economics* 9, 3-18.
- Barber, Brad M., and Terrance Odean, 2000, Trading is hazardous to your wealth: The common stock investment performance of individual investors, *Journal of Finance* 55, 773-806.
- Basu, Sanjoy, 1983, The relationship between earnings yield, market value, and return for NYSE common stocks: Further evidence, *Journal of Financial Economics* 12, 129-156.
- Belsley, D.A., E. Kuh, and R.E. Welsch, 1980, *Regression Diagnostics*, John Wiley and Sons Inc., New York.
- Benartzi, Shlomo and Richard H. Thaler, 2001, Naïve diversification strategies in defined contribution saving plan, *American Economic Review* 91, 79-98.
- Berk, Jonathan B., 2000, Sorting out Sorts, *Journal of Finance* 55, 407-427.
- Black, Fischer, 1972, Capital market equilibrium with restricted borrowing, *Journal of Business* 45, 444-454.
- Black, Fischer, 1993, Beta and return, *Journal of Portfolio Management* 20, 8-18.
- Brailsford, Tim J., and S.A. Easton, 1991, Seasonality in Australian Share Price Indices between 1936 and 1957, *Accounting and Finance* 36, 89-111.
- Branch, Ben, 1977, "A Tax Loss Trading Rule", *Journal of Business* 50, 198-207.
- Brown, Philip, Donald B. Keim, Allan W. Kleidon, and Terry A. Marsh, 1983, Stock return seasonalities and tax-loss selling hypothesis, *Journal of Financial Economics* 12, 105-127.
- Campbell, John Y., Martin Lettau, Burton G. Malkiel, and Yexiao Xu, 2001, Have individual stocks become more volatile? An empirical exploration of idiosyncratic risk, *Journal of Finance* 56, 1-43.
- Cochrane, John H., 1999, New facts in finance, *Economic Perspectives* 23, 36-66.

- Chui, Andy C.W., and John K.C. Wei, 1998, Book-to-market, firm size and the turn-of-the-year effect: Evidence from Pacific-Basin emerging markets, *Pacific-Basin Finance Journal* 6, 275-293.
- Daniel, Kent, and Sheridan Titman, 1997, Evidence on the Characteristics of Cross Sectional Variation in Stock Returns, *Journal of Finance* 52, 1-33.
- Daniel, Kent, Sheridan Titman, and K.C. John Wei, 2001, Explaining the cross-section of stock returns in Japan: Factors or Characteristics?, *Journal of Finance* 56, 743-766.
- Davis, J., Eugene F. Fama, and Kenneth R. French, 2000, Characteristics, Covariances and average returns: 1929-1997. *Journal of Finance* 55, 389-406.
- Drew, Michael E., and Madhu Veeraraghavan, 2001, Explaining the Cross-section of stock returns in the Asian region, *International Quarterly Journal of Finance* 1, 205-221.
- Drew, Michael E., and Madhu Veeraraghavan, 2002a, A Closer Look at the Size and Value Premium in Emerging Markets: Evidence from the Kuala Lumpur Stock Exchange, *Asian Economic Journal* 17, 337-351.
- Drew, Michael E., and Madhu Veeraraghavan, 2002b, Idiosyncratic Volatility and Security Returns: Evidence from the Asian Region, *International Quarterly Journal of Finance*, forthcoming.
- Drew, Michael E., Tony Naughton, and Madhu Veeraraghavan, 2002, Firm Size, Book-to-Market Equity and Security Returns: Evidence from the Shanghai Stock Exchange, Symposium on Stock Markets: Risk, Return and Pricing, Queensland University of Technology/Economics Society of Australia, Brisbane, 16 December.
- Dyl, Edward A., 1977, Capital gains taxation and year-end stock market behavior, *Journal of Finance* 32, 165-175.
- Fama, Eugene F., 1991, Efficient Capital Markets II, *Journal of Finance* 36, 1575-1617.
- Fama, Eugene F., and Kenneth R. French, 1992, The cross-section of expected stock returns, *Journal of Finance* 47, 427-465.
- 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.
- Fama, Eugene F., and Kenneth R. French, 1995, Size and Book-to-Market factors in earnings and returns, *Journal of Finance* 50, 131-155.
- Fama, Eugene F., and Kenneth R. French, 1996, Multifactor explanations of asset pricing anomalies, *Journal of Finance* 51, 55-84.
- Fama, Eugene F., and Kenneth R. French, 1998, Value versus growth: The international evidence, *Journal of Finance* 53, 1975-1999.
- French, Kenneth R., William G. Schwert, and Robert F. Stambaugh, 1987, Expected Stock Returns and Volatility, *Journal of Financial Economics* 19, 3-29.
- Goyal, Amit and Pedro Santa-Clara, 2001, Idiosyncratic Risk Matters, Anderson Graduate School of Management, UCLA.

- Gultekin, Mustafa N., and N. Bulent Gultekin, 1983, Stock market seasonality: International evidence, *Journal of Financial Economics* 12, 469-482.
- Haugen, Robert A., and Phillippe Jorion, 1996, "The January Effect: Still there after all these years", *Financial Analysts Journal* Jan-Feb, 27-31.
- Ho, Y.K., 1990, Stock return seasonalities in Asia Pacific markets, *Journal of International Financial Management and Accounting* 2, 47-77
- Kang, Joseph, Ming-Hua Liu, and Sophie Xiaoyan Ni, 2002, Contrarian and Momentum Strategies in the China Stock Market: 1993-2000, *Pacific-Basin Finance Journal* 10, 243-265.
- Kato, K., and J. Shallheim, 1985, Seasonal and Size anomalies in the Japanese stock market, *Journal of Financial and Quantitative Analysis* 20, 243-260.
- Keim, Donald B., 1983, Size related anomalies and stock return seasonality, *Journal of Financial Economics* 12, 13-32.
- Keim, Donald B., 1985, Dividend Yields and Stock Returns: Implications of Abnormal January Returns, *Journal of Financial Economics* 14, 473-489.
- Keim, Donald B., 1986, Dividend Yields and the January effect, *Journal of Portfolio Management* 12, 54-60.
- Keim, Donald B., and Robert F. Stambaugh, 1986, Predicting returns in the stock and bond markets, *Journal of Financial Economics* 17, 357-390.
- Kothari, S. P., Jay Shanken, and Richard G. Sloan, 1995, Another look at the cross-section of expected stock returns, *Journal of Finance* 50, 185-224.
- Lakonishok, Josef, Andrei Shleifer, and Robert W. Vishny, 1994, Contrarian investment, extrapolation and risk, *Journal of Finance* 49, 1541-1578.
- Lee, Cheng F., Gong-meng Chen, and Oliver M. Rui, 2001, Stock returns and volatility on China's stock markets, *Journal of Financial Research* 24, 523-543.
- Liew, Jimmy, and Maria Vassalou, 2000, Can book-to-market, size and momentum be risk factors that predict economic growth, *Journal of Financial Economics* 57, 221-245.
- Lintner, John, 1965, The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets, *Review of Economics and Statistics* 47, 13-37.
- MacKinlay, Craig A., 1995, Multifactor models do not explain deviations from the CAPM, *Journal of Financial Economics* 38, 3-28.
- Malkiel, Burton G., 1999, *A Random Walk Down Wall Street*, W.W. Norton and Company: New York.
- Malkiel, Burton G., and Yexiao Xu, 1997, Risk and return revisited, *Journal of Portfolio Management* 23, 9-14.
- Malkiel, Burton G., and Yexiao Xu, 2000, Idiosyncratic risk and security returns, working paper, Department of Economics, Princeton University.

- Markowitz, Harry M., 1952, Portfolio Selection, *Journal of Finance* 7, 77-91.
- Merton, Robert C., 1973, An Intertemporal Capital Asset Pricing Model, *Econometrica* 41, 867-887.
- Mukherjee, Sandip, Manjeet S. Dutta, and Yong H. Kim, 1997, A Fundamental Analysis of Korean Stock Returns, *Financial Analysts Journal* May/June, 75-80.
- Narasimhan, Jegadeesh, and Sheridan Titman, 1993, Returns to buying winners and selling losers: Implications for stock market efficiency, *Journal of Finance* 38, 65-91.
- Naughton, Tony and Martin Hovey, 2002, What part do securities' markets play in advancing corporate governance in Asia? Australasian Meeting of the Econometrics Society (ESAM02), Brisbane, Australia, July 7-10, 2002.
- Pastor, Lubos, and Robert F. Stambaugh, 2000, Comparing asset pricing models: an investment perspective, *Journal of Financial Economics* 56, 335-381.
- Reinganum, Marc R., The anomalous stock market behaviour of small firms in January: Empirical tests for tax-loss selling hypothesis, *Journal of Financial Economics* 12, 89-104.
- Roll, Richard, 1983, Vas Ist Das?, *Journal of Portfolio Management* 9, 18-28.
- Roll, Richard, and Stephen A. Ross, 1994, On the Cross-sectional Relation between Expected Returns and Betas, *Journal of Finance* 49, 101-121.
- Rosenberg, Barr, Kenneth Reid, and Ronald Lanstein, 1985, Persuasive evidence of market inefficiency, *Journal of Portfolio Management* 11, 9-17.
- Rozeff, Michael S., and William R. Kinney, 1976, Capital Market Seasonality: the case of stock returns, *Journal of Financial Economics* 3, 379-402.
- Sharpe, William F., 1964, Capital asset prices: A theory of market equilibrium under conditions of risk, *Journal of Finance* 19, 425-442.
- Sun, Qian and Wilson Tong, 2000, The effect of market segmentation on stock prices: The China syndrome, *Journal of Banking and Finance* 24, 1875-1902.
- Tong, W.H.S., 1992, An analysis of the January Effect of United States, Taiwan and South Korean Stock Returns, *Asia Pacific Journal of Management* 9, 189-207
- Xu, Yexiao and Burton G. Malkiel, 2003, Investigating the Behavior of Idiosyncratic Volatility, *Journal of Business*, forthcoming.