The Cross Sectional Relationship between Stock Returns and Domestic and Global Factors in the Chinese A Share Market

Yue Nan Wang*

School of Economics and Finance, RMIT Business, GPO Box 2476V, Melbourne Victoria 3001, Australia

Abstract

By using an extension of the Fama and MacBeth cross-sectional regression model, this paper examines the relationship between stock returns and (i) local beta, (ii) global betas and (iii) some firm-specific characteristics in the Chinese A share market. For the instability of individual stock betas in A shares, the time varying local betas and global betas are estimated by using the method proposed by Schwert and Seguin (1990) to capture time variation in systematic risks and then are used to test the specification of the conditional asset pricing model. The results of this paper suggest neither the conditional local beta nor the global beta has a significant relationship with stock returns in A shares though their effects on stock returns differ. The sub-period tests further indicate that the A share market has not become more integrated with either the world stock markets or the Hong Kong stock market over the period 1995 to 2002. Domestic factors, such as B/M and size, are the most important factors to explain stock returns.

JEL Classification: G12, G14, G15

* Corresponding author. Tel.: +61-3-99251674
E-mail address: yue.wang@rmit.edu.au
The author thanks Professor Robert Brooks and Dr. Amalia Di Iorio for their great support and helpful comments to this paper.
1. Introduction

The cross-sectional relationship between stock returns, market risk and firm-specific characteristics has been widely examined in both developed and emerging markets. However, the nature of the relationship varies across different markets. The traditional Capital Asset Pricing Model (CAPM), developed by Sharpe (1964), Lintner (1965) and Black (1972), explains the positive linear relationship between beta (the covariance of asset return and market return) and asset returns. Fama and French (1992), on the other hand, fail to document the relationship between beta and stock returns. Instead, they find significant effects of size and book-to-market value in explaining stock returns in the U.S. market. At the same time, the tests of the conditional version of the CAPM are carried out by assuming that expected returns and betas vary through time. Many studies have found significant time variability in the conditional expected asset return and risk (see for example, Gibbons and Ferson, 1985, Bodurtha and Mark, 1991 and Ng, 1998) and challenged the role of some firm factors (Jagannathan and Wang, 1996). Thereafter, the roles of beta and a series of firm characteristics, such as size, book-to-market value, earning to price ratio, dividend to price ratio and liquidity etc, in capturing variation in stock returns have been analysed worldwide. Recent literature has further been extended the area of research into the examination of the performance of some global factors in explaining domestic stock returns based on the evidence of world market integration. It is shown that the nature of the relationship between domestic factors (such as domestic beta and firm factors), global factors (such as global beta and currency factor) and stock returns does vary across different markets.
The purpose of the analysis is not only to address the relationship between the conditional local beta and several firm characteristics in the Chinese A share market but also to incorporate global betas into the analysis and investigate if they have any explanatory power for Chinese stock returns. The role of the global beta can also be used to test if there is any integration of the A share market into the world market over the sample period. It is generally accepted that the world’s capital markets are becoming increasingly more integrated. The benefits of international diversification will undoubtedly depend on the extent to which markets are integrated. Theoretically, for a market to be completely integrated, only the global market risk should be priced. This means that the domestic market risk, except the portion already embedded in the global market, must not be able to capture any variation in domestic stock returns. Therefore, no diversification benefits can be identified in that country. Conversely, if a market is completely segmented from the world market, only the domestic market risk should be priced and a market-oriented asset allocation approach would be appropriate. Whether the domestic beta (global beta), as a measurement of domestic market risk (global market risk) performs better against a global beta (domestic beta) over the same sample period will provide evidence of the integration of the Chinese A share market. Specifically, this analysis compares the performance of both conditional and unconditional betas in explaining stock returns. In addition, the explanatory power of some firm-specific characteristics is examined while controlling for systematic risk at the global and local levels.

The Chinese A share market has a history of no more than fifteen years. In fact, the Chinese economy was almost closed to the world before 1978. Even now, foreign investors still do not have free access to invest in China, let alone the capital market.
However, with the rapid development of the Chinese economy in the past decade, some studies have provided the evidence of its market integration with other stock markets (see for example, Niu, 1997 and Johnson and Soenen, 2002). Bekaert and Harvey (1995) also contend that the standard assumptions that capital markets are, and always were, fully integrated or fully segmented are of very limited applicability. Therefore, the MSCI world index and the Hong Kong Heng Seng index are used in an examination of the A share market integration relative to the world market as well as the Hong Kong market. The beta specification in this paper facilitates the analysis of both regional integration and global integration for the A share market.

The Shanghai Stock Exchange and Shenzhen Stock Exchange were established in the early 1990’s and were only designated for the domestic investors up to 2003\(^1\). In order to seek increased foreign investment for Chinese state-owned enterprises, the B shares, originating in 1992, were reserved solely for overseas investors only before 2001 and then were opened to domestic residents on February 19, 2001. The China Securities Regulatory Commission (CSRC) noted that opening the B share market to domestic investors would help promote the internationalisation of the Chinese capital market. Since 1993, enterprises in the Chinese mainland have begun to list on the Hong Kong stock market. These shares are known as H shares. Though many state-owned enterprises have both a domestic and a foreign class of shares (A and B share, or A and H share), B shares and H shares are priced at a large discount to the corresponding A shares. This is regarded as evidence of market segmentation, information asymmetry and lack of

\(^1\) The Chinese government implemented the Qualified Foreign Institutional Investors (QFII) policy in 2003. As of the end of 2003, there were 11 QFIIs, who were allowed to invest in the A share market and the total investment quota had reached USD 1.7 billion according to the report on the web of the Shenzhen Stock Exchange.
investment alternatives in the A share market. As at the end of December of 2002, 75 companies were listed on the H share market. In the meantime, some Chinese companies also had offered ADRs on the NYSE (known as N shares), followed by a few Singaporean listings and Australian listings. It is worth noting that Hong Kong was handed over to China in 1997, implying the integration of both its economic activities and capital market with the mainland. However, there exists an unwritten rule of “one-way traffic”, that is, Chinese companies can list on SEHK or other overseas stock markets but not the other way round. However, several QFIs (Qualified Foreign Institutional Investors) were approved to invest in the A share market in 2003 though the Chinese government still imposes strict restrictions on their investment behaviour. This shows that the Chinese A share market, to some extent, is preparing to take bold steps toward internationalisation. Considering its investment restrictions and currency control policy, the A share market is still regarded as a segmented market and the global beta is not supposed to explain the domestic stock returns. However, it is undeniable that the Chinese A share market has begun to embrace a well-regulated, mature and open market system, especially after China’s entry into the World Trade Organization.

In this study, cross-sectional regression analysis is conducted to examine the relationship between stock returns, local beta, global betas (MSCI world beta and HK beta), and several firm-specific characteristics. The calculation of diagnostic test, such as the White test and ARCH LM test shows that heteroscedasticity is a problem in beta estimation,

---

3 Source: web of the CSRC.
4 As regards the relationship between the internationalization of the Chinese stock market and WTO, please refer to Pei and Qiu (2002)
especially with regard to the local beta. This study also finds wide variation in the betas relative to the MSCI world index and the Heng Seng index as evidenced by the range in the minimum and maximum estimates. Time varying betas for individual stocks in the A share market are estimated using the method of Schwert and Segiun (1990) in the first pass, and the cross sectional regressions indicate that even the time varying betas cannot explain stock returns in A shares. When the overall sample period is divided into two and three equal sub-periods, only the MSCI world beta is found significant in explaining stock returns from January 1995 to August 1997. There is no evidence that the A share market has become more integrated with either the world market or the Hong Kong market in the sample period. In fact, B/M and size are the two most important factors that influence stock performance in the A share market. Interestingly, neither of these factors has a persistent effect on stock returns from 1995 to 2002.

This paper is organized as follows. Section 2 presents the literature review. Section 3 sets out the data and methodology. Relevant empirical results are provided in section 4, and the conclusions are summarised in section 5.

2. Literature Review

The traditional Capital Asset Pricing Model (CAPM) has been extensively applied to examine stock price behavior in different stock markets. As stated by the CAPM, beta, as the only measurement of market risk, has a positive linear relationship with the expected return for any asset. The early tests of the unconditional version of the CAPM were carried out by Black, Jensen and Scholes (1972) and Fama and MacBeth (1973), who
employed a two-stage procedure by performing a cross sectional regression of the realized security’s return on its unconditional beta estimated in the first stage and assuming that expected returns and betas were constant over a fixed period. Tests of the CAPM at the conditional level were performed by Gibbons and Ferson (1985), Ferson, Kandel and Atambaugh (1987) at the early stage who allowed expected returns to vary through time though assumed constant conditional covariances. Bodurtha and Mark (1991), Ng (1991), De Santis and Gerard (1997) and others then modeled time varying conditional covariances in their studies. Actually, the evidence of time varying covariances in individual common stocks has been found in many studies analyzing a variety of financial markets. For the US market, see Fabozzi and Francis (1978), Sunder (1980), Bos and Newbold (1984), Collins, Ledolter and Rayburn (1987), and Bos and Fetherston (1995). Other markets include: Australia (see for example Brooks, Faff and Lee, 1992); Finland (Bos, Fetherston, Martikainen and Perttunen, 1995); Korea (Bos and Fetherston, 1992); Hong Kong (Cheng, 1997) and Malaysia (Brooks and Faff, 1997). The empirical studies of beta-pricing models find that beta exhibits statistically significant variability over time and the conditional CAPM specification is rather strong when betas and returns are allowed to vary over time (e.g. Bollerslev, Engle and Wooldridge 1988, Ferson and Harvey 1991, 1993 and Jagannathan and Wang 1996).

In fact, the validity of the CAPM in the equity market has been a controversial problem for decades. Fama and French (1992) challenge the role of beta in explaining stock returns in the U.S. market. Their empirical evidence fails to find the explanatory power of beta even when beta is the only independent variable. Instead, they document significant size and book-to-market effects. Even though the explanatory power of beta has been
confirmed by some researchers, they are of the view that beta is not the only measurement of risk, and provide some evidence of the conditional role of beta. For example, Kothari, Shanken and Sloan (1995) suggest a beta effect but argue that beta alone cannot explain all variation in stock returns. Pettengill, Sundaram and Mathur (1995) propose the significant conditional relationship between beta and stock returns in the up and down market. Heston, Rouwenhorst and Wessels (1999) find that average stock returns are positively related to beta and negatively related to firm size. These findings stimulated the enthusiasm of other researchers to further examine the effect of beta and all other firm-specific characteristics in both industrial and emerging markets. Many studies show that the beta effect cannot be identified and some firm specific factors are more important than beta in capturing variation in stock returns, such as the size effect (see Chui and Wei, 1998 and Lau, Lee and McInish, 2002), and the book-to-market effect (see Barry, Goldreyer, Lockwood and Rodriguez, 2002).

However, there is still a controversy over the size and B/M effects. Chan, Hamao and Lakonishok (1991) contend that the statistical significance of market capitalization variable is sensitive to the specification of the model. Shumway and Warther (1999) find there is no size effect after correction for delisting bias. Knez and Ready (1997) point out that the size effect is not robust to the removal of extreme observations. Kothari et al. (1995) argue that selection bias influences the role of B/M ratio. Jagannathan and Wang (1996) demonstrate that the size effect and the statistical rejections of the CAPM become much weaker when betas and returns are allowed to vary over time. In further examinations of the CAPM, other researchers have argued that poor estimates of beta may also lead one to falsely reject the CAPM. For example, Kim (1995) explores the
possibility that the CAPM is rejected in the presence of the error-in-variables problem when the first-pass time-series regression coefficients cannot be estimated without bias. Shanken (1992) and Kan and Zhang (1999) suggest the sampling error in the first-pass estimator causes errors in variables.

For the Chinese A share market, little attempt has been made to estimate the form of instability that beta takes and the performance of the conditional CAPM in the Chinese A share market. Brooks (2003) calculates time varying betas on the A and B share indices relative to the world index and finds the pattern of time variation is consistent with the timing of many of the regulatory development in the Chinese markets. Therefore, employing time varying betas estimated in the first pass to run the monthly regressions can better explain the role of beta and other firm factors in the A share market.

With regards to the issue of world market integration, the question of whether there exists a global asset-pricing model such that the performance of different equity markets can be explained has also attracted great attention. Solnik (1974b) proposes a simple international market structure consistent with the international asset pricing model (IAMP) and uses this approach to study the pricing of European and American securities relative to their international risk level (see Solnik, 1974a). However, this simple extension of the traditional form of the CAPM has important limitations as detected by Stulz (1981), Solnik (1977) and Alder and Dumas (1983). Firstly, the validity of the IAPM requires that world capital markets be fully integrated and there exists no risk exposure to exchange rates. Secondly, a universal risk free rate across different markets should be available for the framework of the IAPM.
In the meantime, considering the gradual integration of the world market, research work is not confined to taking into account the domestic factors in an equity market. In the scenario wherein stock returns are influenced by both domestic and international factors, previous studies have already included both domestic and global factors to examine their explanatory power. In the 1970’s, Solnik (1995) and Lessard (1976) studied the importance of domestic, international and industrial factors in the returns to stocks and documented that domestic factors were much stronger than international factors. Beckers, Connor and Curds (1996) employ simple factor models of worldwide equity returns to test the global influence (global market index and global industries) and national influence (national market index), and they find some hints of integration in Europe but not worldwide. Lombard and Roulet (1999) also argue the dominance of domestic factors in explaining stock returns in the U.S. and an apparent industrial factor to indicate the integration. Diermeier and Solnik (2001) explore the influence of domestic, international and currency factors on the extent of international activities for listed companies and find strong evidence that some companies are globally priced. Clarkson, Ragunathan and Nowland (2002) find that Australian firm returns are related to regional market, global industry and currency factors. Barry et al. (2002) use the global beta into the examination of stock returns in emerging equity markets and find no evidence of integration.

Many empirical studies in China focus on the pricing difference for dual-listed mainland companies to document market segmentation. Ma (1996) examines the capital controls in the A and B markets. He attributes the price discount in B shares to the investors’
attitudes towards risk. Su (1999) also tests these ownership restrictions and documents that the A share market is segmented from the B share market. Fung, Lee and Leung (2000) employ the latent variable asset-pricing model to test the market segmentation in the A share market and the B share market. The research work regarding the integration of the Chinese A share market with the world market has only been carried out at the regional level. Karmel (1996) and Niu (1997) document the prospect for the integration of the A share market into the Hong Kong stock market. Johnson and Soenen (2002) find evidence that the equity market of China is integrated with the stock market in Japan by using three Geweke measures of feedback. Yeh and Lee (2000) only find an influential role of the Hong Kong stock market on the Shanghai and Shenzhen B stock markets but not on A shares. Brooks (2003) demonstrates that the time varying betas on the A and B share indices relative to the world index are very low. Based on the Chinese government’s policies, the process of integrating the A share market into the world market is still slow.

3. Data and Methodology

Monthly stock prices, cash dividend yields, adjusted earnings per share, market to book values, market values, number of shares outstanding and turnover by volume for all A shares listed on the Shanghai Stock Exchange and Shenzhen Stock exchange are obtained from the Datastream database covering the period from January 1994 to December 2002. The monthly closing prices for the Shanghai A share index, Shenshen A share index, MSCI world index and Heng Seng index are downloaded respectively from the
Datastream database as well\(^5\). The monthly returns for the MSCI world index and Heng Seng index reported in US dollar and HK dollar are then converted to RMB returns using end-of-month exchange rates, which are also downloaded from the Datastream database\(^6\). The financial firms and firms with negative market to book value are eliminated from the sample. Moreover, firms with no more than six months’ listing prior to the formation period are also excluded to alleviate the affects of the IPO underpricing.\(^7\) Only those firms that have all the relevant data available will be included in the monthly examination.

### 3.1 Beta Estimation

Despite the desirability of modeling the time varying betas into the explanation of stock returns in the Chinese A share market, the ordinary least square (OLS) beta is also estimated first by considering the following market model for comparison:

\[
R_{it} = a_i + \beta_i R_{mt} + \epsilon_{it} \tag{1}
\]

where \(R_{it}\) is the return on stock \(i\), \(R_{mt}\) is the return on the market portfolios and \(\epsilon_{it}\) is assumed to be distributed \(IN(0, \sigma^2)\) and \(\beta_i\) is the systematic risk of stock \(i\), which will then be used in the Fama and MacBeth model to make a comparison with the time varying beta. At least twelve months for which returns are available for individual stocks are used in the OLS beta estimation.

---

\(^5\) According to Harvey and Zhou (1993), Cumby and Glen (1990) and Chou and Lin (2002), the MSCI world index is a good proxy for world market portfolio.

\(^6\) This paper simplifies the issue of exchange rate by assuming this risk is not priced separately from the market risk. (see Adler and Dumas, 1983). In addition, Zhang and Zhao (2003) argue the exchange risk cannot account for the price differential in A, B and H shares.

\(^7\) The exclusion of new listings is because Chinese IPOs are highly underpriced. The A share IPOs in Shanghai were 289% underpriced according to Mok and Hui (1998). (see also Chen, Firth and Kim, 2004).
The time varying betas for all individual stocks are estimated by using the Schwert and Seguin (1990) approach. Brooks, Faff and McKenzie (1998) investigate three techniques for the estimation of conditional time-dependent betas: (i) a multivariate generalized ARCH approach first introduced by Bollerslev (1990); (ii) a time–varying betas market model approach suggested by Schwert and Seguin (1990); (iii) the Kalman filter technique. Although their findings support the superiority of the Kalman filter approach, they contend that the results of those three techniques are qualitatively similar to each other. Other studies utilizing the Schwert and Seguin (1990) approach include Koutmos, Lee and Theodossiou (1994) and Episcopos (1996)

The Schwert an Seguin (1990) approach estimates the conditional beta $\beta_{it}$ of a stock return series as:

$$\beta_{it} = b_1 + \frac{b_2}{h_{Mt}}$$

(2)

where $h_{Mt}$ refers to the conditional variance of the market index, and $b_1$ and $b_2$ are regression coefficients from the equation:

$$R_{it} = a_0 + b_1 R_{Mt} + b_2 r_{Mt} + \varepsilon_{it}$$

(3)

where: $R_{it}$ = the return to stock $i$;
$R_{Mt}$ = the market return;
$r_{Mt} = R_{Mt}/ h_{Mt}$; and
$\varepsilon_{it}$ = the error term

Following Schwert and Seguin (1990), the conditional variance ($h_{Mt}$) of the market index in this estimation procedure is obtained from a GARCH (1, 1) model fitted to the market return series by using the following equation:
\[ h_{Mt} = r_0 + r_t \varepsilon_{t-1}^2 + r_2 h_{Mt-1} \]  

(4)

where \( h_{Mt} \) is a function of the mean \( r_0 \), news about volatility from the previous period \( \varepsilon_{t-1}^2 \) (ARCH term), and last periods forecast variance \( h_{Mt-1} \) (GARCH term).\(^8\)

Three market return series are used in this paper to estimate both the OLS betas and time varying betas of individual stocks in the A share market. They are the value-weighted A share index returns\(^9\), the MSCI world index returns and the Hong Kong Heng Seng index returns. The Heng Seng index is orthogonalised to the MSCI index for the higher correlation coefficient between them\(^10\).

### 3.2 The Cross Sectional Regressions

In cross-sectional regressions, the following information for each firm is employed: stock returns, size, E/P, B/M, liquidity, local beta, MSCI world beta and HK beta. For each stock, the return is defined as the logarithm of price difference. Size is the logarithm of market equity in million RMB. Monthly E/P is earnings per share divided by the corresponding price. B/M is the reciprocal of market to book value. Liquidity is defined as the ratio of the number of share traded in a month to the number of shares outstanding\(^11\). Outliers of observations on monthly returns, E/P, D/P, B/M and liquidity are trimmed by setting the largest and smallest 1% of the observations equal to the next

---

\(^8\) The Schwert and Seguin approach is prone to a “start-up” value problem, so the first twelve observations of beta are excluded leaving a restricted sample commencing in January 1995, which is also corresponding to the restricted sample of the OLS beta estimation.

\(^9\) Value-weighted market index means Shanghai A share index and Shenzhen A share index are combined together by putting value weight on them. The two indices are highly correlated (0.86) during the sample period.

\(^10\) The correlation coefficient between the MSCI world index and the Heng Seng index is 0.65.

\(^11\) A large portion of shares (state shares and legal-entity shares) in a typical firm is still not allowed to trade. The Chinese government is now considering downsizing the state-owned shares.
largest and smallest respectively to avoid the influence of outliers in the regression as suggested by Knez and Ready (1997).

As the Datastream database contains data as published, all sorting characteristics would have been available to investors at the time of rebalancing, and no forward information will be used for calculation. All the information for an individual stock will be rebalanced monthly. The Fama and MacBeth (1973) regression procedure is then used to conduct three empirical analyses by using 95 monthly holding period returns of individual stocks as dependent variables. Though CAPM test is better undertaken using portfolios of securities as portfolios betas are subject to less measurement error than individual betas, this analysis uses individual stocks since the number of stocks in the A share market varies considerably from January 1995 to December 2002. Therefore, it is impossible to construct sufficient portfolios to run the cross sectional regressions for all months and insufficient portfolios make statistical techniques become less reliable. Lagged independent variables are used to allow for a delayed response due to nonsynchronous trading. The models can be regarded as an extension of the Fama and MacBeth model and are as follows:

\[ R_{it} = \alpha_0 + \alpha_1 \beta_{l, t-1} + \epsilon_{it} \]  

\[ R_{it} = \alpha_0 + \alpha_1 \beta_{l, t-1} + \alpha_2 \beta_{w, t-1} + \epsilon_{it} \]  

\[ R_{it} = \alpha_0 + \alpha_1 \beta_{l, t-1} + \alpha_2 \beta_{w, t-1} + \alpha_3 \beta_{h, t-1} + \alpha_4 \frac{E}{P}_{it-1} + \alpha_5 \frac{E}{P \text{ dummy}}_{it-1} + \alpha_6 \frac{D}{P}_{it-1} + \alpha_7 \frac{D}{P \text{ dummy}}_{it-1} + \alpha_8 \text{SIZE}_{it-1} + \alpha_9 \text{B/M}_{it-1} + \alpha_{10} \text{LIQ}_{it-1} + \epsilon_{it} \]  

where \( R_{it} \) is the monthly returns on individual stocks. \( \beta_{l, t-1} \) is the lagged time-varying (OLS) local beta. \( \beta_{w, t-1} \) and \( \beta_{h, t-1} \) are the lagged time varying (OLS) MSCI world beta and
HK beta respectively. \( E/P_{it-1}, D/P_{it-1}, \) \( SIZE_{it-1}, \) \( B/M_{it-1}, \) \( LIQ_{it-1} \) stand for the lagged independent variables as stated above. \( E/P \) dummy and \( D/P \) dummy are dummy variables. If earnings are positive, \( E/P \) dummy equals 0. If earnings are negative, \( E/P \) equals 0 and \( E/P \) dummy equals 1. Similarly, if dividend yield is positive, \( D/P \) dummy equals 0. If dividend yield is 0, \( D/P \) equals 0 and \( D/P \) dummy equals 1. \( \alpha_i \) is the set of unknown parameters to be estimated and \( \epsilon_{it} \) is the error term. The averages of the time series slopes from these month-by-month, cross-sectional regressions, \( \alpha_i = (\sum \alpha_{it})/T, \) \( i=0,1,2,3, \) are risk premiums associated with risk factors (betas and firm characteristics), and are reported in the next section. t-statistics are also provided to determine whether the averages of slopes are significantly greater than zero. If the specification of the conditional CAPM is strong in the A share market, the time varying beta should have the ability to explain the stock returns in this market. Moreover, if the A share market is segmented, the international risk factors, \( \beta^w \) and \( \beta^h, \) should not influence the A share market and not be priced, i.e., \( \alpha_2 = \alpha_3 = 0. \)

### 4. Empirical Results

Table 1 presents the correlation matrix for monthly returns on the three equity market indices. The correlation coefficients between the value-weighted China index and Heng Seng index, the value-weighted China index and MSCI world index are very low (0.02 for both), which suggests that the Chinese stock market is possibly quite segmented from the world markets. On the other hand, the correlation between the Hong Kong stock market and world stock market is positive (0.65) and significant at 5% level. Stehle (1977) argues that integration should be tested by isolating in the global index the
component which is not correlated with the domestic index, since domestic markets are usually positively correlated with the return on the global market. However, considering the correlation coefficients between those three indices, this study only orthogonalizes the HK index to the MSCI world index to avoid multicollinearity. The results in Panel B show that thin trading is not a problem in all three stock markets. However, significant autocorrelation is detected at the first lag for portfolio 7 and 8 as presented in Table 2.

[table 1 about here]

4.1 A Comparison of the Conditional and Unconditional Beta Estimates

For a comparison of the unconditional and conditional beta estimates, twelve portfolios are constructed based on their book-to-market values at the beginning of each month and equally weighted monthly returns for each portfolio are then calculated.\textsuperscript{12}. Portfolio 1 is the portfolio with the smallest B/M value whereas portfolio 12 is the one with the largest B/M value. Single factor regression results in table 2 indicate that the OLS betas, in the domestic version, irrespective of the choice of portfolio, are all significantly different from zero at the 5\% level and range from 0.823 to 1.178. However, the results for the international version of the market model using the return on the MSCI index and Heng Seng index as proxies for market returns suggest that none of the portfolios has a significant international beta. These betas are all very small and some are even negative, which demonstrates that the Chinese A share market has very low correlation with the world markets. With respect to the multi-factor regression, the analysis shows that the

\textsuperscript{12} For beta comparison, this paper constructs portfolios according to B/M values. As suggested in Drew, Naughton and Veeraraghavan (2003), there is a significant B/M value effect in the Chinese A share market.
local beta values are not affected by the inclusion of any other market returns into the equation. The standard deviations for the local betas are generally the smallest.

The stability of beta obtained from all single factor regressions and multi-factor regressions is tested by using the White test for unconditional heteroscedasticity and the ARCH LM test for conditional heteroscedasticity. The results of these tests are presented in Table 2 as well. There is strong evidence of heteroscedasticity in more than half of the portfolios for the single factor domestic market model. Comparing the betas obtained from the domestic market model to those using the international variants of the market model indicates that of the twelve portfolios there are only three portfolios with an ARCH-LM test significant at the 5% level. The results of beta stability test in the multi-factor regressions are similar, which suggests that using time varying beta instead of OLS betas in the cross sectional regression is more appropriate. These findings are consistent with the results of Bos et al. (1995), who find that the domestic beta are significant for all stocks and portfolios, but not statistically significant when the US index is used in the Finnish market. Once again, they find little evidence of international beta instability for Finish stocks.

The last three columns of Table 2 represent the results of the mean conditional beta estimation against three series of market returns. These were estimated using the Schwert and Seguin approach. The mean conditional values for the local beta are similar to the

---

13 Since beta instability can be linked to heteroscedasticity according to Fabozzi and Francis (1978), Bos and Newbold (1984) and Brooks, Faff and Lee (1992).
point estimates of beta provided by the market model and those conditional betas do vary in time according to their high and low ranges. The largest range of observed values of the local beta is obtained in portfolio 8, whose beta values vary from 0.70 to 1.23. As regards the mean conditional values for the MSCI beta and Heng Seng beta and their ranges, it is more apparent that the mean conditional betas for all portfolios are quite different from the point estimates of beta. Further, the conditional values for the MSCI and Heng Seng betas for some portfolios vary even more through time. For example, the time varying MSCI beta values for portfolio 1 vary considerably from –0.13 to 1.55.

Basically, it is well accepted that beta instability arises for individual stocks. Further, finance theory suggests that the process of portfolio formation can diversify away individual stock beta instability. However, Gregory-Allen, Impson and Karafiath (1994), Brooks et al. (1992) find that instability is increased with portfolio formation. The question in this analysis is---if portfolio betas of A shares is proved to be unstable, does it necessarily mean that individual stock betas in the A share market are not stable as well? Brooks, Faff and Lee (1994) investigate this matter and argue that portfolios tend to have the same characteristic as the stock of which they are composed. Their findings justify the utilization of time varying betas for individual stocks in the A share market.

Table 3 presents the estimated coefficient values for the Schwert and Seguin conditional beta estimation as well as their respective $t$-statistics, the $R^2$ value and standard error of estimate. The explanatory power of the regressions for the conditional local betas ranges from a high of 0.806 to a low of 0.550. On the contrary, the $R^2$ values for the world beta

---

14 See for example Fabozzi and Francis (1978), Bos and Newbold (1984) and Brooks et al. (1992)
and HK beta regressions are extremely low, which again implies low correlations between the A share market and the world market. The coefficient, $b_1$, is significant at the 1% level for all regressions using the A share index as a proxy but not statistically significant when the MSCI world index and the Heng Seng index are used as proxies. Not surprisingly, the statistical significance of $b_2$ is weak in all regressions----none of those coefficients is significant at the 5% level. This result is similar to that reported in previous papers which have also used this technique (see Episcopos 1996 and Brooks et al.1998). Using the estimated coefficient values for $b_1$ and $b_2$, conditional beta series $\beta_{it}$ ($=b_1 + b_2/h_{Mt}$) were generated and the mean values of those series have been presented in Table 2. Comparing the first moment of the $\beta_{it}$ series to the market model generated point estimates, one can find that large differences exist regardless of which market index is used. Despite the poor estimates of $b_2$, the mean conditional local betas provide a similar parameterization of risk to the market model generated point estimates as reported in Table 2.

4.2 The Cross Sectional Regression Results

Table 4 contains the empirical results for the monthly regressions over the whole sample period. Neither the time varying local beta nor the OLS local beta can explain stock returns in A shares when they are used alone in the cross sectional regressions and both of the coefficients are negative though the time varying beta appears to be a better estimate of systematic risk. When three time varying betas are used together as explanatory variables in the equation 6, there is no evidence that the specification of the conditional CAPM works since none of the three coefficients are significantly different
from zero at the 5\% level. In accordance with the theory, one would expect to find a positive statistically significant relationship between beta and returns. A negative risk return relationship has no theoretical meaning, for it indicates that investors subjected to a higher systematic risk will earn a lower rate of return. However, when comparing the regression results of both the time varying betas and the OLS betas in the equation 7, one can find that the trade off between the time varying local beta and return is positive, which is encouraging, though none of these betas has a statistically significant relationship with stock returns. It is worth noting that the coefficients of B/M value is always the most significant factor that captures variation in stock returns. It is significant at the 1\% level with t statistics of 2.639 and 2.723 when examined along with the time varying betas and the OLS betas respectively. The large differences lie in the performances of the E/P and size factors between the conditional and unconditional models. Jagannathan and Wang (1996) argue that when betas and returns are allowed to vary over time by assuming that the CAPM holds period by period, the size effects and the statistical rejections of the model become much weaker. However, the results of this investigation contrast with their findings. The role of size is even more important when the time varying betas instead of the OLS betas are included in the regressions. It is significant at the 5\% level with a t statistic of -2.008 in the conditional regression. The E/P factor has a significantly positive relationship with returns only when the time varying betas are included as explanatory variables in the equation 7.

Table 5 provides the results for the re-examination of the effects of the time varying betas and other firm specific characteristics in two equal sub-periods and three equal sub-
periods. From January 1995 to December 1998, the conditional local beta, the MSCI beta and the HK beta are not significant at all in each of the three analyses. Among all firm factors, E/P is positively related to stock returns and significant at the 10% level. The effect of B/M factor is significant at the 1% level, which is similar to earlier findings (e.g. Fama and French, 1992, Arshanapalli, Coggin and Doukas, 1998 and Barry et al., 2002). However, size does not have the ability to explain stock returns in the A share market in this period. Interestingly, from 1999 to November 2002, the only factor that captures variation in stock returns is size, in which case its effect is strong and significant at the 1% level. There is no B/M effect in the second sub-period, which suggests the effect of none of those factors is persistent.

When the whole sample period is divided into three sub-periods, the results are even more interesting. From January 1995 to August 1997, both the E/P and B/M factors appear to explain stock returns. This finding seems to suggest that investors in this period paid great attention to the value of listed companies in the A share market. Notably, the time varying MSCI beta has explanatory power and is positively related to stock returns. However, in the next two sub-periods, its effect does not persist. Both the time varying MSCI and HK betas change their signs from positive in the first sub-period to negative in the next two sub-periods. During the second sub-period, when the Asian financial crisis occurred, the performance of stocks in the A share market is only related to the size factor and no improvement in the performance of the global betas can be identified. Therefore, there is no evidence that the A share market became more integrated with the world markets during the financial crisis. The result is not consistent with the finding of
Longin and Solnik (1995), who document that cross-country stock market correlations are larger when large shocks occur. In this case, an explanation for this finding could be that the A share market is not open to foreign investors and the Chinese currency is not convertible. Surprisingly, in the last sub-period, the average time varying beta coefficient is -0.0068 and significant at the 5% level. Actually, from June of 2001, the CSRC aggravates the crack down on excessive speculation in the A share market, which has led to a significant fall in the stock market. The negative relationship between the conditional local beta and stock returns might reflect the impacts of the measures that have been taken by the CSRC. Moreover, the size effect is strong and there is no value effect.

Finally, figure 1 plots the time series coefficients of the local, MSCI and HK betas for the equation 7. Graph (a) exhibits the time series coefficients for the time varying betas whereas graph (b) plots those of the OLS betas. For both the OLS betas and the time varying betas, there is no clear pattern of coefficient movements. However, larger negative and positive spikes before July 2000 may reflect the recent regulatory developments in the Chinese market. This is particular so for the local beta coefficient in October 1996 as seen in graph (b). It was at this time that the CSRC regulated the release of information and cracked down on illegal credits and price manipulation by syndicate speculators. Although neither the time varying beta nor the OLS beta can explain stock returns in A shares, these two graphs do show that the time varying betas and the OLS betas produce different monthly coefficients in the equation 7. For example, the coefficient for the time varying local beta is 0.266 in October 1996 whereas the coefficient for the OLS local beta is -0.049. Moreover, the fluctuation of the time varying
beta coefficients is more significant than that of the OLS beta coefficients, which tends to suggest that the unconditional model has value in a particularly volatile market.

[figure 1 about here]

5. Conclusion

Complete market segmentation or market integration is still a rarity in empirical literature (see Bekaert and Harvey, 1995). This analysis places its emphasis on examining the role of the local and global betas in explaining stock returns in the Chinese A share market, which has long been regarded as a comparatively closed market. Instead of limiting the study to the traditional OLS point estimates of beta in the cross sectional regressions, this analysis also employs the Schwert and Seguin approach to estimate the time varying betas for individual stocks given the evidence of beta instability has been found in both the local beta and global betas.

Despite the Schwert and Seguin approach providing a more accurate estimation of individual stock betas, the cross sectional regressions show that neither the conditional local beta nor the conditional global betas (the MSCI beta and HK beta) has the ability to explain stock returns in the Chinese A share market, which distinguishes it from many other stock markets worldwide. From May 2000 to November 2002, the local beta appears to have a significantly negative relationship with stock returns, which requires more attention. Generally, the results of this study do not suggest there is any improvement in the A share market integration with the world markets even during the financial crisis period. This finding, to some extent, contradicts the argument of
Groenewold, Tang and Wu (2004), who contend that the mainland market became more closely linked to the Hong Kong market after crisis by using vector-autoregressive models (VARs). The Hong Kong stock market, which is supposed to have a much closer relationship with the mainland, has little significance in the pricing of domestic stocks. This indicates that the cost of capital is still high in China and diversification benefits potentially exist.

This analysis also indicates that two firm specific characteristics---the B/M and size factors are the most important factors in explaining stock returns in China. However, neither of these factors has a persistent effect on the performance of stocks from 1995 to 2002. Local risk factors are priced more significantly in domestic stocks than global risk factors. The effect of local risk factors is not influenced by any global beta factor over the whole sample period. In addition, the fact that none of these variables plays a significant and persistent role indicates that the investment philosophy in the emerging Chinese A share market changes considerably and this market is still subject to more regulatory developments. However, the Chinese government appears to be embarking on a process that will eventually lead to a mature and efficient regulatory system, which is compatible with many international market standards. Therefore, one may expect that the role of local beta, global beta and many other firm specific characteristics may experience changes in the future. Hence, further studies regarding the performance of beta, B/M and size in the A share market are worthwhile.
Table 1
Correlation Matrix and Autocorrelations for Various Market Indices in RMB from January 1994 to December 2002
* Significant at the 5% level

Panel A: Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>Heng Seng Index</th>
<th>MSCI World Index</th>
<th>VW China Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heng Seng Index</td>
<td>1.00000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSCI World Index</td>
<td>0.65344*</td>
<td>1.00000</td>
<td></td>
</tr>
<tr>
<td>VW China Index</td>
<td>0.02304</td>
<td>0.02717</td>
<td>1.00000</td>
</tr>
</tbody>
</table>

Panel B: First Order Autocorrelation

<table>
<thead>
<tr>
<th></th>
<th>0.01762</th>
<th>-0.02989</th>
<th>-0.09094</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolios</td>
<td>( \rho^{(1)} )</td>
<td>( \beta_l )</td>
<td>( \beta_w )</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------</td>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>P1</td>
<td>-0.124</td>
<td>0.864 (^{abc})</td>
<td>0.172</td>
</tr>
<tr>
<td></td>
<td>( \text{std or H/L} )</td>
<td></td>
<td>0.081</td>
</tr>
<tr>
<td>P2</td>
<td>0.071</td>
<td>1.178 (^*)</td>
<td>0.011</td>
</tr>
<tr>
<td></td>
<td>( \text{std or H/L} )</td>
<td></td>
<td>0.085</td>
</tr>
<tr>
<td>P3</td>
<td>-0.064</td>
<td>0.989 (^{b})</td>
<td>-0.010</td>
</tr>
<tr>
<td></td>
<td>( \text{std or H/L} )</td>
<td></td>
<td>0.067</td>
</tr>
<tr>
<td>P4</td>
<td>-0.062</td>
<td>1.035 (^{abc})</td>
<td>0.019 (^c)</td>
</tr>
<tr>
<td></td>
<td>( \text{std or H/L} )</td>
<td></td>
<td>0.064</td>
</tr>
<tr>
<td>P5</td>
<td>-0.160</td>
<td>0.919 (^{abc})</td>
<td>0.080</td>
</tr>
<tr>
<td></td>
<td>( \text{std or H/L} )</td>
<td></td>
<td>0.062</td>
</tr>
<tr>
<td>P6</td>
<td>0.041</td>
<td>1.032 (^{abc})</td>
<td>0.076</td>
</tr>
<tr>
<td></td>
<td>( \text{std or H/L} )</td>
<td></td>
<td>0.053</td>
</tr>
<tr>
<td>P7</td>
<td>-0.207 (^a)</td>
<td>0.849 (^{abc})</td>
<td>0.051 (^c)</td>
</tr>
<tr>
<td></td>
<td>( \text{std or H/L} )</td>
<td></td>
<td>0.058</td>
</tr>
<tr>
<td>P8</td>
<td>-0.218 (^a)</td>
<td>0.823 (^{abc})</td>
<td>-0.058 (^c)</td>
</tr>
<tr>
<td></td>
<td>( \text{std or H/L} )</td>
<td></td>
<td>0.086</td>
</tr>
<tr>
<td>P9</td>
<td>-0.169</td>
<td>0.884 (^{abc})</td>
<td>-0.008</td>
</tr>
<tr>
<td></td>
<td>( \text{std or H/L} )</td>
<td></td>
<td>0.061</td>
</tr>
<tr>
<td>P10</td>
<td>-0.083</td>
<td>0.894 (^{abc})</td>
<td>0.051</td>
</tr>
<tr>
<td></td>
<td>( \text{std or H/L} )</td>
<td></td>
<td>0.060</td>
</tr>
<tr>
<td>P11</td>
<td>-0.074</td>
<td>0.863 (^{abc})</td>
<td>0.060</td>
</tr>
<tr>
<td></td>
<td>( \text{std or H/L} )</td>
<td></td>
<td>0.055</td>
</tr>
<tr>
<td>P12</td>
<td>-0.048</td>
<td>0.915 (^*)</td>
<td>-0.103</td>
</tr>
<tr>
<td></td>
<td>( \text{std or H/L} )</td>
<td></td>
<td>0.071</td>
</tr>
</tbody>
</table>

Table 2

**Unconditional and Conditional Estimates of Twelve Portfolio Betas against Domestic and World Market Indices**

This table presents the OLS point estimates of beta obtained using the market model with twelve B/M portfolios against the value-weighted Chinese A share index returns, the Morgan Stanley Capital International (MSCI) world index returns and the Hong Kong Heng Seng index returns for both the single factor regressions and multi-factor regressions. The Heng Seng index is orthogonalized to the MSCI world index in the multi-factor regressions and conditional beta estimations. The mean conditional betas estimated using the Schwert and Seguin approach is presented in the last three columns. The standard deviations of OLS regressions and the highest and lowest values of time varying betas for each portfolio are in parentheses. \( \rho^{(1)} \) stands for the first order autocorrelation. The sample period covers from 1995 to 2002.

- \( ^{a} \) Significant different from zero at the 5% level
- \( ^{b} \) White test is significant at the 5% level
- \( ^{c} \) ARCH-LM test is significant at the 5% level
Table 3
Schwert and Seguin Augmented Market Model Estimation for Twelve B/M Portfolios in the Chinese A Share Market

This table reports the estimated coefficient values and descriptive statistics for the regression $R_{it} = a_0 + b_1 R_{Mt} + b_2 r_{Mt} + \epsilon_{it}$, where $R_{it}$ is the monthly return for portfolio $i$ in month $t$, $R_{Mt}$ is the monthly return for the local market index, the MSCI world index and the Hong Kong Heng Seng index respectively in month $t$ and $r_{Mt}$ is the monthly market return divided by an estimate of the contemporaneous conditional volatility of the market return produced from a GARCH model. T-statistics are in parentheses.

* Significant different from zero at the 5% level

<table>
<thead>
<tr>
<th>Portfolios</th>
<th>conditional local betas ($\beta_{il}$)</th>
<th>conditional world betas ($\beta_{iw}$)</th>
<th>conditional HK betas ($\beta_{ih}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$b_1$</td>
<td>$b_2$</td>
<td>$R^2$</td>
</tr>
<tr>
<td>P1</td>
<td>0.735*</td>
<td>0.00017</td>
<td>0.550</td>
</tr>
<tr>
<td></td>
<td>(5.269)</td>
<td>(1.056)</td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>1.375*</td>
<td>-0.00023</td>
<td>0.765</td>
</tr>
<tr>
<td></td>
<td>(9.851)</td>
<td>(-1.442)</td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td>1.016*</td>
<td>0.000033</td>
<td>0.701</td>
</tr>
<tr>
<td></td>
<td>(7.281)</td>
<td>(-0.181)</td>
<td></td>
</tr>
<tr>
<td>P4</td>
<td>1.056*</td>
<td>-0.00002</td>
<td>0.738</td>
</tr>
<tr>
<td></td>
<td>(7.569)</td>
<td>(-0.155)</td>
<td></td>
</tr>
<tr>
<td>P5</td>
<td>0.764*</td>
<td>0.00020</td>
<td>0.708</td>
</tr>
<tr>
<td></td>
<td>(5.478)</td>
<td>(1.288)</td>
<td></td>
</tr>
<tr>
<td>P6</td>
<td>1.097*</td>
<td>-0.00008</td>
<td>0.806</td>
</tr>
<tr>
<td></td>
<td>(7.861)</td>
<td>(-0.524)</td>
<td></td>
</tr>
<tr>
<td>P7</td>
<td>0.762*</td>
<td>0.000010</td>
<td>0.697</td>
</tr>
<tr>
<td></td>
<td>(5.460)</td>
<td>(0.655)</td>
<td></td>
</tr>
<tr>
<td>P8</td>
<td>0.586*</td>
<td>0.00029</td>
<td>0.634</td>
</tr>
<tr>
<td></td>
<td>(4.198)</td>
<td>(1.840)</td>
<td></td>
</tr>
<tr>
<td>P9</td>
<td>0.851*</td>
<td>0.00003</td>
<td>0.691</td>
</tr>
<tr>
<td></td>
<td>(6.102)</td>
<td>(0.202)</td>
<td></td>
</tr>
<tr>
<td>P10</td>
<td>0.812*</td>
<td>0.00009</td>
<td>0.697</td>
</tr>
<tr>
<td></td>
<td>(5.819)</td>
<td>(0.569)</td>
<td></td>
</tr>
<tr>
<td>P11</td>
<td>0.778*</td>
<td>0.00010</td>
<td>0.721</td>
</tr>
<tr>
<td></td>
<td>(5.574)</td>
<td>(0.611)</td>
<td></td>
</tr>
<tr>
<td>P12</td>
<td>0.808*</td>
<td>0.00012</td>
<td>0.619</td>
</tr>
<tr>
<td></td>
<td>(5.793)</td>
<td>(0.726)</td>
<td></td>
</tr>
</tbody>
</table>
Table 4

This table presents the time series average slopes and t statistics from the monthly regressions of stock returns on local beta, MSCI beta, HK beta, E/P, D/P, B/M, Size and Liquidity. For each stock, all relevant information is rebalanced at the beginning of each month from January 1995 to November 2002. Time varying betas are estimated by using that of Schwert and Seguin (1990). The OLS betas are estimated by regressing individual stock returns against value-weighted local market returns and global market returns respectively, using at least 12 months for which returns are available for the stock. The Heng Seng index is orthogonalized to the MSCI index to avoid multicollinearity. E/P is the earning to price ratio. If E/P>0, E/P dummy is 0, otherwise E/P=0 and E/P dummy is 1. D/P is the dividend yield. If D/P>0, D/P dummy is 0, otherwise D/P=0 and D/P dummy is 1. T-statistics are reported in italic and are computed as the average slope divided by its time series standard error.

* significant at 10% level
** significant at 5% level
*** significant at 1% level

Panel A: Using Time-varying Betas as Explanatory Variables

<table>
<thead>
<tr>
<th>Model</th>
<th>Intercept</th>
<th>tv Local Beta</th>
<th>tv MSCI Beta</th>
<th>tv HK Beta</th>
<th>E/P dummy</th>
<th>D/P dummy</th>
<th>B/M</th>
<th>SIZE</th>
<th>LIQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5)</td>
<td>0.0033</td>
<td>-0.0009</td>
<td>0.661</td>
<td>-0.156</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6)</td>
<td>0.0034</td>
<td>-0.0011</td>
<td>-0.0019</td>
<td>-0.0011</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7)</td>
<td>0.0108</td>
<td>0.0031</td>
<td>0.0009</td>
<td>-0.0023</td>
<td>0.0995</td>
<td>-0.0002</td>
<td>0.0007</td>
<td>0.0181</td>
<td>-0.0022</td>
</tr>
<tr>
<td></td>
<td>0.931</td>
<td>0.656</td>
<td>0.319</td>
<td>-0.604</td>
<td>1.957*</td>
<td>1.252</td>
<td>-0.481</td>
<td>0.558</td>
<td>2.639***</td>
</tr>
</tbody>
</table>

Panel B: Using Traditional OLS Betas as Explanatory Variables

<table>
<thead>
<tr>
<th>Model</th>
<th>Intercept</th>
<th>OLS Local Beta</th>
<th>OLS MSCI Beta</th>
<th>OLS HK Beta</th>
<th>E/P dummy</th>
<th>D/P dummy</th>
<th>B/M</th>
<th>SIZE</th>
<th>LIQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5)</td>
<td>0.0069</td>
<td>-0.0059</td>
<td>1.339</td>
<td>-1.551</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7)</td>
<td>0.0113</td>
<td>-0.0004</td>
<td>0.0021</td>
<td>0.0011</td>
<td>0.0579</td>
<td>-0.0006</td>
<td>0.0001</td>
<td>0.0007</td>
<td>0.0196</td>
</tr>
<tr>
<td></td>
<td>0.975</td>
<td>-0.181</td>
<td>1.548</td>
<td>0.470</td>
<td>1.044</td>
<td>-0.320</td>
<td>0.151</td>
<td>0.540</td>
<td>2.723***</td>
</tr>
</tbody>
</table>
Table 5
This table reports the average coefficients and corresponding t statistics for three models as stated above in two and three equal sub-periods. The average coefficients are the time series averages of monthly regression slopes. T statistics are in italic.

* significant at 10% level  
** significant at 5% level  
*** significant at 1% level

<table>
<thead>
<tr>
<th>Model</th>
<th>Intercept</th>
<th>tv Local Beta</th>
<th>tv MSCI Beta</th>
<th>tv HK Beta</th>
<th>E/P dummy</th>
<th>D/P dummy</th>
<th>B/M</th>
<th>SIZE</th>
<th>LIQ</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: Using two equal sub-periods</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>01/1995-12/1998</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5)</td>
<td>0.0028</td>
<td>-0.0001</td>
<td>0.309</td>
<td>-0.010</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6)</td>
<td>0.0030</td>
<td>-0.0005</td>
<td>0.0001</td>
<td>-0.0026</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7)</td>
<td>-0.0093</td>
<td>0.0066</td>
<td>0.0052</td>
<td>-0.0043</td>
<td>0.1711</td>
<td>0.0030</td>
<td>-0.0003</td>
<td>0.0007</td>
<td>0.0297</td>
</tr>
<tr>
<td></td>
<td>-0.515</td>
<td>0.819</td>
<td>1.394</td>
<td>-0.708</td>
<td>1.891*</td>
<td>0.863</td>
<td>-0.548</td>
<td>0.365</td>
<td>2.634***</td>
</tr>
<tr>
<td><strong>01/1999-11/2002</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5)</td>
<td>0.0038</td>
<td>-0.0018</td>
<td>0.938</td>
<td>-0.328</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6)</td>
<td>0.0038</td>
<td>-0.0018</td>
<td>-0.0040</td>
<td>0.0005</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7)</td>
<td>0.0313</td>
<td>-0.0005</td>
<td>-0.0035</td>
<td>-0.0002</td>
<td>0.0264</td>
<td>0.0016</td>
<td>0.0000</td>
<td>0.0006</td>
<td>0.0063</td>
</tr>
<tr>
<td></td>
<td>2.223</td>
<td>-0.090</td>
<td>-0.784</td>
<td>-0.041</td>
<td>0.605</td>
<td>0.971</td>
<td>-0.092</td>
<td>0.467</td>
<td>0.842</td>
</tr>
</tbody>
</table>
Table 5 Cont’d

<table>
<thead>
<tr>
<th>Model</th>
<th>Intercept</th>
<th>tv Local Beta</th>
<th>tv MSCI Beta</th>
<th>tv HK Beta</th>
<th>E/P dummy</th>
<th>D/P dummy</th>
<th>B/M</th>
<th>SIZE</th>
<th>LIQ</th>
</tr>
</thead>
</table>

Panel B: Using three equal sub-periods

01/1995-08/1997

(5) 0.0047  0.0002  0.357  0.013
(6) 0.0044 0.0000  0.0030  0.0047  0.372  -0.002  0.599  0.628
(7) -0.0422 0.0121  0.0085  0.0013  0.3109  0.0096  -0.0003  0.0411  0.0005  0.0411  0.0020  -0.0037

<table>
<thead>
<tr>
<th>09/1997-04/2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5) 0.0025  0.0040  0.382  0.458</td>
</tr>
<tr>
<td>(6) 0.0037  0.0030  -0.0037  -0.0087  0.566  0.347  -0.590  -1.058</td>
</tr>
<tr>
<td>(7) 0.0416  0.0038  -0.0010  -0.0071  -0.0735  -0.0026  0.0002  0.0005  0.0061  -0.0049  0.0030</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>05/2000-11/2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5) 0.0027  -0.0072  0.790  -2.061**</td>
</tr>
<tr>
<td>(6) 0.0021  -0.0066  -0.0052  0.0007  0.611  -1.926*  -1.043  0.217</td>
</tr>
<tr>
<td>(7) 0.0336  -0.0068  -0.0049  -0.0009  0.0599  0.0024  -0.0004  0.0011  0.0068  -0.0038  -0.0153</td>
</tr>
</tbody>
</table>

05/2000-11/2002
Figure 1.

The graphs exhibit the movements of the coefficients of the OLS and time varying local beta, MSCI beta and HK beta based on the monthly regression of model 5 and model 7 respectively.

(a) Time Series Coefficients of the OLS local and Global Betas from the Monthly Regressions of Returns from 1995-2002

(b) Time Series Coefficients of the Time-varying local and Global Betas from the Monthly Regressions of Returns from 1995-2002
Reference


35


Heston, S., Rouwenhorst, K. G. and Wessels, R. (1999), the Role of Beta and Size in the Cross-section of European Stock Returns, European Financial Management 5, 9-27.


