Chapter 5

Analysis and Comparison of Asian Stock Markets Using Integrated Time-Varying Model Processing

Many countries in Asia experienced steep falls in their exchange rates in late 1997 and early 1998. The collapse of the Thai baht's peg in July 1997 is recorded as the beginning of the rapid spread of the financial crisis in East Asia. The investors often need to evaluate the risk in the stock market. Particularly, the global investors have to evaluate market for adjusting their portfolio. In this research, we use financial and econometric model base with time varying, State Space CAPM, Bayesian CAPM, Quantile regression CAPM. The alpha and beta values in ten Asian Stock Markets show the minimum and maximum values by aspect of CAPM model.

The highest time-varying alpha among portfolios in all Asian Stock Markets are presented by The Quantile estimator. The State Space estimator presents highest time-varying beta among portfolios in all Asian Stock Markets. The Quantile estimator presents the lowest time-varying beta among portfolios in all Asian Stock Markets. The State Space estimator and Bayesian estimator show the closely value in the median.

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ABSTRACT

This paper analyses the risk-return relationships of Asian stock markets with a time-varying CAPM model for ten Asian Stock Markets. We purpose the Adaptive Least Squares with Kalman foundations, Bayesian, and Quantile regression for estimating the time-varying CAPM model and comparing the alpha, beta for each estimator. The values of time-varying alpha and beta, estimated from Quantile regression, are much greater and lesser than the estimating- value of the time- varying alpha and beta, estimated from The Bayesian and Kalman filtered estimator at quantile 2.5% and 97.5%. The Bayesian and Kalman filtered estimator present the closely value.

Keywords: *Time-varying CAPM, State-Space model, Kalman filtered, Bayesian, Quantile regression.*

5.1 Introduction

Many countries in Asia experienced steep falls in their exchange rates in late 1997 and early 1998. The collapse of the Thai baht's peg in July 1997 is recorded as the beginning of the rapid spread of the financial crisis in East Asia. There are the evidence to support the existence of relationship between the stock markets of Thailand and Indonesia, and between Thailand and the Philippines, over both the pre- and post-1997 crisis periods (Daly, 2003). The Singapore and Taiwan are cointegrating with Japan while Hong Kong is cointegrating with the United States and the United Kingdom. There are no long run equilibrium relationship between Malaysia, Thailand and Korea and the developed markets of the United States, the United Kingdom and Japan. The relationship between the developed and emerging markets also change over time .The relationship between the developed and emerging markets also change over time (Wong, Penm ,Terrell, Lim, 2004).

One important evaluation for the relationship is to check the CAPM, the risk-return relationships with a time-varying CAPM model. The CAPM states that the systematic difference in security returns can be explained by a single measure of risk. The CAPM are often debatable due to many obstacles, including non-stationarity of beta coefficient and risk premium, inadequate proxy of the market portfolio, straightforward relationship between expected return on an asset and market risk premium, and joint hypothesis test problems associated with unobservable expected returns.

In previous empirical test, the model is biased against finding a significant relationship between beta and expected returns because the relationship between beta and realized returns is conditional on the market return. In bull markets, high beta securities should be rewarded for bearing risk with higher returns than low beta securities, but in bear markets high-risk, high-beta securities experience lower returns than low beta securities. Pettengill, Sundaram, and Mathur (1995) confirm a significant direct relationship between beta and returns in up markets and a significant inverse relationship between beta and returns in down markets. The suggestions in many empirical researches show that the testing methodology is inappropriate (Calvet and Lefoll, 1989; Roll and Ross, 1994; Chan and Chen, 1988; Fama and French, 1992).

In particular, most of the CAPM tests hold beta coefficients constant in the sense of developing to explain differences in risks across capital assets. (Jagannathan and McGrattan, 1995). However, the firms often change their risk structures in conjunction with the macroeconomic environment that is the firm will vary over time. Hence, the examining the relationship between return and beta using time series tests in the sense of time-varying properties of beta coefficients seems more realistic than the non-stochastic beta assumption.

Although Jagannathan and Wang (1994) point out that the constant beta assumption is not reasonable. (C.f Ferson and Harvey, 1991; Fama and French, 1992; Chan and Chen, 1988; Groenwold and Fraser, 1999; Black and Fraser, 2000; Fraser et al., 2000). Jagannathan and Wang (1995) and Lettau and Ludvigson (2001) show that conditional CAPM with a time-varying beta outperforms the unconditional CAPM with a constant beta.

The purpose of this paper examines the asymmetric risk-return relationships in the up and down markets with a time-varying beta model. The Adaptive Least Squares with Kalman foundations proposed by McCulloch (2006), Bayesian

(Quintana, Iglesias and Galea (2005); Johnson and Sakoulis (2008); Busse and Irvine (2006); Christodoulakis (2002); Herold and Maurer (2003)), Quantile regression (Ma and Pohlman(2008)) , are used to estimate the time-varying beta model.

5.2 Financial and Econometric Model Base with Time Varying

In this section, we are going to give a brief summary about the time varying models, such us State Space CAMP, Bayesian CAMP and Quantile regression CAMP that economists often used. State Space modeling in macroeconomics and finance has become widespread over the last decade. Many dynamic time series models in economics and finance may be represented in State Space form, as the system of equation. The work of (Zellner and Chetty 1965) shows the optimal Bayesian portfolio problem by Bayes' rule, the posterior density $p(r|\theta)$ is proportional to the product of the sampling density (the likelihood function) and the prior density, $f(r|\theta)\,p(\theta)$. The Koenker and Bassett (1978) developed the median (quantile) regression estimator to minimize the symmetrically weighted sum of absolute errors (where the weight is equal to 0.5) to estimate the conditional median (quantile) function. Then we will present an integrated procedure to construct an appropriate model for the stock data.

5.2.1 State Space CAPM

Typically, the State Space models can be found in most books (Durbin & Koopman (2001), and Chan (2002)). The State Space model equation can be compactly expressed as

$$\begin{pmatrix}\alpha_{t+1}\\ y_t\end{pmatrix} = \underset{(m\times N)\times 1}{\delta_t} + \underset{(m+N)\times m}{\Phi_t}\ \underset{m\times 1}{.\alpha_t} + \underset{(m\times N)\times 1}{\mu_t} \tag{2.1}$$

where $\alpha_t \sim$ N(**a**, **P**), $\mu_t \sim$ WN (0,1)

and $\delta_t \begin{pmatrix} d_t \\ c_t \end{pmatrix}, \Phi_t = \begin{pmatrix} T_t \\ Z_t \end{pmatrix}, \mu_t = \begin{pmatrix} H_t \mu_t \\ G_t \varepsilon_t \end{pmatrix}, \Omega_t = \begin{pmatrix} H_t H_t{}' & 0 \\ 0 & G_t G_t{}' \end{pmatrix}.$

The initial value parameters are summarized in the (m + 1) × m matrix $\Sigma = \begin{pmatrix} P \\ a' \end{pmatrix}$. The smoothed estimate of the response y_t and its variance are computed using

$$\hat{y}_t = c_t + Z_t \hat{\alpha}_t \qquad \operatorname{var}(\alpha_t | Y_n) = Z_t \operatorname{var}(\alpha_t | Y_n) Z_t' \tag{2.2}$$

The smoothed disturbance estimates are the estimates of the measurement equations innovations ε_t and transition equation innovations η_t based on all available information Y_n, and are denoted $\hat{\varepsilon}_t = E[\alpha_t | Y_n]$ (or $\varepsilon_{t|n}$) and $\hat{\eta}_t = E[\eta_t | Y_n]$ (or $\eta_{t|n}$), respectively. The computation of $\hat{\varepsilon}_t$ and $\hat{\eta}_t$ from the Kalman smoother algorithm is described in Durbin & Koopman (2001). These smoothed disturbance estimates can be useful for parameter estimation by maximum likelihood and for diagnostic checking. The vector of prediction errors v_t and prediction error variance matrices F_t are computed from the Kalman filtered recursions.

State Space representation of a time varying parameter regression model consider a Capital Asset Pricing Model (CAPM) with time varying intercept and slope

$$\begin{aligned} y_t &= \alpha_t + \beta_{M,t} x_{M,t} + v_t , & v_t \sim \text{WN}, \\ \alpha_{t+1} &= \alpha_t + \xi_t , & \xi_t \sim \text{WN}, \\ \beta_{M,t+1} &= \beta_{M,t} + \varsigma_t & \varsigma_t \sim \text{WN}, \end{aligned} \qquad (2.3)$$

where y_t denotes the return on an asset in excess of the risk free rate, and $x_{M,t}$ denotes the excess return on a market index. In this model, both the abnormal excess return α_t and asset risk $\beta_{M,t}$ are allowed to vary over time following a random walk specification. Let $\alpha_t = (\alpha_t, \beta_{M,t})'$, $x_t = (1_t, x_{M,t})'$, $H_t = diagccc(\sigma_{\xi_t}, \sigma_{\zeta})'$ and $G_t = \sigma_v$. Then the State Space form equation (2.1) of equation (2.3) is $\begin{pmatrix} \alpha_{t+1} \\ y_t \end{pmatrix} = \begin{pmatrix} I_2 \\ x_t' \end{pmatrix} \alpha_t + \begin{pmatrix} H_t \eta_t \\ G_t \varepsilon_t \end{pmatrix}$ and has parameters

$$\Phi_t = \begin{pmatrix} I_2 \\ x_t' \end{pmatrix}, \Omega = \begin{pmatrix} \sigma_\xi^2 & 0 & 0 \\ 0 & \sigma_\zeta^2 & 0 \\ 0 & 0 & \sigma_{v\xi}^2 \end{pmatrix} \qquad (2.4)$$

The variance matrix P of the initial state vector α_1 is assumed to be of the form $p = p_* + \kappa p_\infty$. Since α_t is I(1) the initial state vector α_1 requires an infinite variance so it is customary to set a = 0 and P = $k\mathrm{I}_2$ with $k \to \infty$. Using equation (2.4), the initial variance is specified with p_*= 0 and $p_\infty = \mathrm{I}_2$. Therefore, the initial state matrix $\Sigma = \begin{pmatrix} P \\ a' \end{pmatrix}$ for the time varying CAPM has the form $\Sigma = \begin{pmatrix} -1 & 0 \\ 0 & -1 \\ 0 & 0 \end{pmatrix}$. The State Space parameter matrix Φ_t in equation (2.4) has a time varying system element $Z_t = x_t'$. The specification of the State Space form for the time varying CAPM requires values for the variances σ_ξ^2 σ_ς^2 and σ_v^2 as well as a data matrix X whose rows correspond with $Z_t = x_t' = (1, r_{M,t})$. The values Φ_t associated with x_t' in the third row are set to zero. In the general State Space model equation (2.1), it is possible that all of the system matrices δ_t, Φ_t and Ω_t have time varying elements.

The typical CAPM regression model is, $y_t = \alpha + \beta_M x_{M,t} + \xi_t$, ξ_t~WN. The y_t denotes the return on an asset in excess of the risk free rate, and $x_{M,t}$ is the excess return on a market index. The State Space representation is given by $\begin{pmatrix} \alpha_{t+1} \\ y_t \end{pmatrix} = \begin{pmatrix} I_k \\ x_t' \end{pmatrix} \alpha_t + \begin{pmatrix} 0 \\ \sigma_\xi \xi_t \end{pmatrix}$ with $x_t = (1, x_{M,t})'$ and the state vector satisfies $\alpha_{t+1} = \alpha_t = \beta = (\alpha, \beta_M)'$. The State Space system matrices are $T_t = I_K$, $Z_t = x_t'$, $G_t = \sigma_\xi$ and $H_t = 0$. Estimating the CAPM with time varying coefficients in equation (2.3) subject to random walk evolution are showed in data. Neumann (2002) surveys several estimation strategies for time varying parameter models and concludes that the State Space model with random walk specifications for the evolution of the time varying parameters generally performs very well. The log-likelihood is parameterized using $\varphi = \left(\ln(\sigma_\xi^2), \ln(\sigma_\varsigma^2), \ln(\sigma_v^2)\right)'$ so that $\sigma^2 = \left(\exp(\varphi_1), \exp(\varphi_2), \exp(\varphi_3)\right)'$. The maximum likelihood estimates for φ which estimates of $\varphi = \left(\ln(\sigma_\xi^2), \ln(\sigma_\varsigma^2), \ln(\sigma_v^2)\right)'$.

These methods estimated the standard deviations $\sigma_{\xi}\,\sigma_{\varsigma}$ and σ_{v} as well as estimated standard errors.

5.2.2 Bayesian CAPM

The predictive density function reflects estimation risk explicitly since it integrates over the posterior distribution, which summarizes the uncertainty about the model parameters, updated with the information contained in the observed data. The Bayes' rule, the posterior density $p\left(r|\theta\right)$ is proportional to the product of the sampling density (the likelihood function) and the prior density, $f\left(r|\theta\right)p\left(\theta\right)$.

The decision-making under uncertainty are represented portfolio choice problem. Let r_{T+1} denote the vector $\left(N\times 1\right)$ of next-period returns and W current wealth. The next-period wealth is $W_{T+1}=W\left(1+\omega' r_{T+1}\right)$ in the absence of a risk-free asset. The next-period wealth $W_{T+1}=W\left(1+r_f+\omega' r_{T+1}\right)$ is a risk-free asset with return r_f is present. Let ω denote the vector of asset allocations. The optimal portfolio decision consists of choosing ω that maximizes the expected utility of next-period's wealth, $\max_{\omega} E\left(U\left(W_{T+1}\right)\right)=\max_{\omega}\int U\left(W_{T+1}\right)p\left(r|\theta\right)dr$, subject to feasibility constraints, where θ is the parameter vector of the return distribution and U is a utility function generally characterized by a quadratic or a negative exponential functional form. The distribution of returns is $p\left(r|\theta\right)$,. The $\max_{\omega} E\left(U\left(W_{T+1}\right)\right)=\max_{\omega}\int U\left(W_{T+1}\right)p\left(r|\theta\right)dr$, is conditional on the unknown parameter vector θ, which are set θ equal to its estimate

$\widehat{\theta}(r)$ based on some estimator of the data r (often the maximum likelihood estimator). Then, the optimal allocation given by $\omega^* = \arg\max_{\omega} E\left(U(\omega' r) \middle| \theta = \widehat{\theta}(r)\right)$.

The return generating process for the stock's excess return is $r_i = \alpha + \beta' f_t + \varepsilon_t, t = 1,\ldots,T,$. The f_t is denoted a (K x 1) vector of factor returns (returns to benchmark portfolios), and ε_t is a mean-zero disturbance term. Then, the slopes of the regression in $r_i = \alpha + \beta' f_t + \varepsilon_t$ are stock's sensitivities (betas). In a single factor model such as the CAPM, the benchmark portfolio is the market portfolio. The implications for portfolio selection of varying prior beliefs about a pricing model are expressed, the prior mean of α, α_0, is set equal to zero. It could have a non-zero value. The prior variance σ_α of α reflects the investor's degree of confidence in the prior mean a zero value of σ_α represents dogmatic belief in the validity of the model; $\sigma_\alpha = \infty$ suggests complete lack of confidence in its pricing power.

5.2.3 Quantile Regression CAPM

The other conditional quantile functions are estimated by minimizing an asymmetrically weighted sum of absolute errors, where the weights are functions of the quantile of interest. Thus, Quantile regression is robust to the presence of outliers. Engle and Manganelli (1999) and Morillo (2000) used in financial applications. The general Quantile regression model, as described by Buchinsky (1998), is $y_i = x_i' \beta_\theta + \mu_{\theta i}$ or, alternatively, $\theta = \int_{-\infty}^{x_i'\beta_\theta} f_y(s|x_i)\,ds$, where β_θ is an unknown k × 1 vector of regression parameters associated with the θ_{th} percentile x_i is a k × 1 vector of independent variables, y_i is the dependent variable of interest, and $\mu_{\theta i}$ is an unknown error term. The θ_{th} conditional quantile of y given x is $Quant_{\theta}\left(\mu_{\theta i}|x_i\right) = x_i'\beta_{\theta}$.Its estimate is given by $x_i'\hat{\beta}_{\theta}$. As θ increases continuously, the conditional distribution of y given x is traced out. Although many of the empirical Quantile regression papers assume that the errors are independently and identically distributed (i.i.d.), the only necessary assumption concerning $\mu_{\theta i}$ is $Quant_{\theta}\left(\mu_{\theta i}|x_i\right) = 0$, That is, the conditional θ_{th} quantile of the error term is equal to zero. Thus, the Quantile regression method involves allowing the marginal effects to change for firms at different points in the conditional distribution by estimating β_{θ} using several different values of θ, $\theta \in (0,1)$ It is in this way that Quantile regression allows for parameter heterogeneity across different types of assets. Thus, the Quantile regression estimator can be found as the solution to the following minimization problem: $\hat{\beta}_{\theta} = \arg_{\beta} \min\left(\sum_{i:y_i \succ x_i'\beta} \theta\left|y_j - x_i'\beta\right| + \sum_{i:y_i \prec x_i'\beta} (1-\theta)\left|y_i - x_i'\beta\right|\right)$ By minimizing a weighted sum of the absolute errors, the weights are symmetric for the median regression case ($\theta = 0.5$) and asymmetric otherwise. The former implies that the method is computationally straightforward while the latter implies that $\sqrt{n}\left(\hat{\beta}_{\theta} - \beta_{\theta}\right) \xrightarrow{d} N\left(0, \Omega_{\theta}\right)$, The CAPM presents $E_t\left(R_{i,t+1}\right) = \gamma_{1,t+1}\beta_{i,\tau}$ as τ < t + 1. The beta-risk is determined over moving samples. The $\beta_{i,\tau}$ is the beta-risk obtained from a time series regression. $R_{i,\tau} = \alpha_i + \beta_{i,\tau}R_{m,\tau} + \mu_{i,\tau}$. The $R_{i,\tau}$ and $R_{m,\tau}$ are the excess return on the asset and the market portfolio, respectively.

5.2.4 The integrated Process

To test unit root, the raw daily sector index data are collected from Reuters, which includes 145,266 observations.

Comparing the alpha and beta in all estimators is investigated for maximum and minimum values. The parameters values at quantile 2.5% for minimum and quantile 97.5% for maximum will be shown for each sector in each market. The Quantile estimator, the State Space estimator, and Bayesian estimator are used for comparision. Particularly, the symmetry testing which is the less restrictive hypothesis of symmetry, for asymmetric least squares estimators, is applied to the Quantile regression case.

Here is a summary of the integrated Process.

Step1. Review the data, selecting the candidate models

Step2. Models decision based on the minimum and maximum of alpha and beta

Step3. Comparing the alpha and beta in all estimators

Step4. Comparing the parameters

Step5. Result illustration

5.3 Empirical Study

5.3.1 Data Description

The raw daily sector index data, Australian Securities Exchange (ASX), Bombay Stock Exchange (BSE), Hong Kong Stock Exchange (HKEX), Indonesia Stock Exchange (IDX), Korea Exchange (KRX), Kuala Lumpur Stock Exchange (KLSE), Shanghai Stock Exchange (SSE), Singapore Exchange (SGX), Taiwan Stock Exchange Corporation (TSEC), are collected from Reuters from June 19, 2007 to July

3, 2009. The Stock Exchange of Thailand (SET) is collected from Reuters from March 1, 1993 to July 30, 2009.

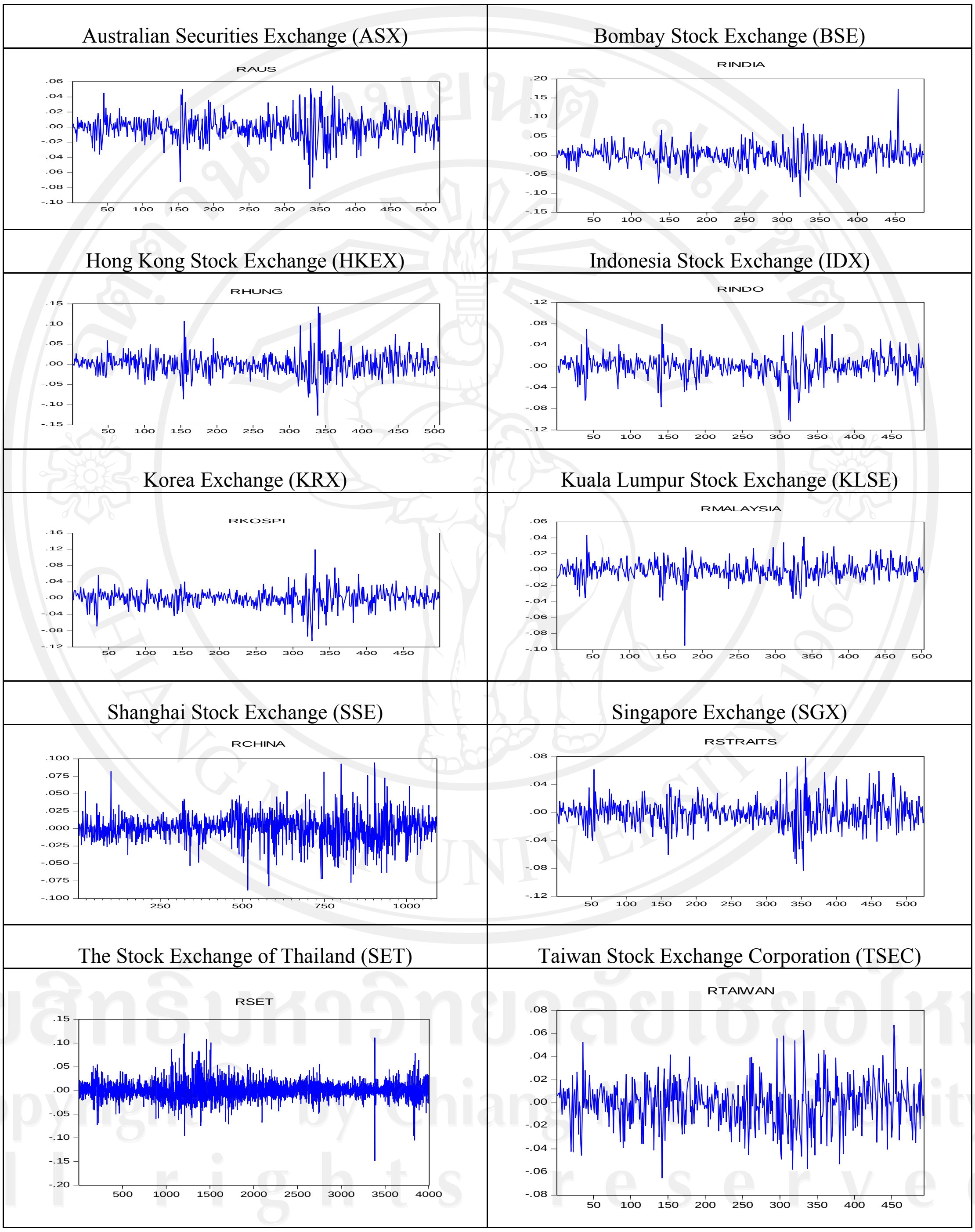

Figure 1. The Returns of Asia Stock Index

The ADF unit root tests for the all sector indexes, as well as their log differences (or rates of return). The original time series in logarithms are checked for stationary. In figure 1, it is clear that the sector indexes are non-stationary, while their rates of return are stationary. The results of the rates of return are stationary compared with the 1 % critical values to indicate rejection of the unit root null hypothesis.

The test of symmetry testing is the less restrictive hypothesis of symmetry, for asymmetric least squares estimators, but the approach is applied to the Quantile regression case. We may evaluate this restriction using Wald tests on the Quantile process. The Wald test formed for this null is zero under the null hypothesis of symmetry.

Table 1 shows the Quantile estimator that presents the highest time-varying alpha among portfolios in all Asian Stock Markets, with all values in the region of 0.0248 to 0.9206 of Plantation (PLANTATION) sector in the Kuala Lumpur Stock Exchange (KLSE), and Transport & Logistic (TL) sector in Stock Exchange of Thailand (SET) respectively. The lowest time-varying alpha among portfolios in all Asian Stock Markets are all in the region of -0.0238 to -0.0706 of Properties (PROPERTY) sector in the Kuala Lumpur Stock Exchange (KLSE), and Utilities (UTIL) sector in the Singapore Exchange (SGX) respectively.

The State Space estimator presents highest time-varying beta among portfolios in all Asian Stock Markets, with all values in the region of 1.2596 to 1.7443 of Information Technology (INFOR) sector in the Shanghai Stock Exchange (SSE), and HSCI-Energy (ENER) sector in Hong Kong Stock Exchange (HKEX) respectively. The Quantile estimator presents the lowest time-varying beta among portfolios in all Asian Stock Markets, with all values in the region of -0.3396 to 0.7406 of TECK (TECK) sector in the Bombay Stock Exchange (BSE), and Health Care (HEALTH) sector in the Shanghai Stock Exchange (SSE) respectively. The State Space estimator and Bayesian estimator show the closely value in the median.

The test of symmetry testing compares estimates at the 2.5% and 97.25% quartile with the median specification. The Bombay Stock Exchange (BSE) shows individual coefficient restriction test values even less evidence of asymmetry of Auto (AUTO), Bankex (BANKEX). The Hong Kong Stock Exchange (HKEX) shows The HSI - Com & Ind (COM), HSI – Finance (FIN), HSCI – Financials (FINB), HSCI - Prop & Con (PROP), HSI – Properties (PROPS) and HSCI – Tele (TELE). The Indonesia Stock Exchange (IDX) shows Agriculture (AGRI), Consumer (CONS), Financial (FIN), and Infrastructure (INFRA). The Korea Exchange (KRX) shows Banking - Miner, (BANKING), Construction, (CONSTR), Communication Service (CS), Electricity Gas (EG), Iron Steel Metal (ISM), Machinery (Mach), Paper Wood (PAPE), Securities – Miner (SECUR), Transportation Equipment (TE), Transport & Storage (TS), Textile, Wearing Apparel (TWA). The Kuala Lumpur Stock Exchange (KLSE) shows sectors of Construction (CONS), Consumer Products (CP), Industrial Products (IP), Plantation (PLANTATION), Properties (PROPERTY), and Technology (TECHNOLOGY). The Shanghai Stock Exchange (SSE) shows sectors of Consumer Staples (CONSTA), Financials (FINAN), Industrial Products (INDUS), and Telecom Services (TELE). The Singapore Exchange (SGX) shows sectors of Re Est H&D (ESTHD), Con Serve (SERV), Technology (TECH), Utilities (UTIL). The Stock Exchange of Thailand (SET) shows all sectors. The Taiwan Stock Exchange Corporation (TSEC) shows Bank and Insurance (BI), Biotech & Med Care (BMC), Cement (CEMENT), Chemical (CHEMICAL), Ele & Machinery (EM), Glass & Ceramic (GC), and Transportation (TRANS).

Table 1: The Maximum and Minimum Time Varying Coefficient of Alpha, Beta in CAPM Model

Countries/ Sectors/ Estimator	Alpha		Beta	
	Maximum	Minimum	Maximum	Minimum
Australian Securities Exchange (ASX)	0.0435	-0.0404	1.4876	0.3062
	Information Technology (INFORM)	Information Technology (INFORM)	Materials (MATERIALS)	Telecommunication Services (TELE)
	Quantile Estimator	Quantile Estimator	Quantile Estimator	Quantile Estimator
Bombay Stock Exchange (BSE)	0.0449	-0.0552	1.5143	-0.3396
	TECK (TECK)	Realty (REALTY)	Realty (REALTY)	TECK (TECK)
	Quantile Estimator	Quantile Estimator	Bayesian Estimator	Quantile Estimator
Hong Kong Stock Exchange (HKEX)	0.0409	-0.0425	1.7443	0.1788
	HSCI - Materials (MATE)	HSCI - Materials (MATE)	HSCI - Energy (ENER)	HSI - Utilities (UTIL)
	Quantile Estimator	Quantile Estimator	State-Space Estimator	State-Space Estimator
Indonesia Stock Exchange (IDX)	0.0485	-0.0421	1.5109	-0.2241
	Agriculture (AGRI)	Misc – Industry (MISC)	Mining (MIN)	Infrastructure (INFRA)
	Quantile Estimator	Quantile Estimator	Quantile Estimator	State-Space Estimator
Korea Exchange (KRX)	0.0442	-0.0409	1.6765	0.602
	Finance - Major (FINANCE),	Machinery (MACH)	Securities - Miner (SECUR)	Communication Service (CS)
	Quantile Estimator	Quantile Estimator	State-Space Estimator	State-Space Estimator
Kuala Lumpur Stock Exchange (KLSE)	0.0248	-0.0238	1.6507	-0.00001123
	Plantation (PLANTATION)	Properties (PROPERTY)	Consumer Products (CP)	Technology (TECHNOLOGY)
	Quantile Estimator	Quantile Estimator	State-Space Estimator	State-Space Estimator
Shanghai Stock Exchange (SSE)	0.0382	-0.0287	1.2596	0.7406
	Health Care (HEALTH)	Telecom Services (TELE)	Information Technology (INFOR)	Health Care (HEALTH)
	Quantile Estimator	Quantile Estimator	State-Space Estimator	Quantile Estimator
Singapore Exchange (SGX)	0.0615	-0.0706	1.322	0.1087
	Utilities (UTIL)	Utilities (UTIL)	Bas Mat (BASMAT)	Technology (TECH)
	Quantile Estimator	Quantile Estimator	State-Space Estimator	State-Space Estimator

Stock Exchange of Thailand (SET)	0.9206	-0.0365	1.3994	-0.0012
	Transport & Logistic (TL)	Petrochem, & Chemicals (PC)	Banking (BANKING)	Professional Services (PS)
	Quantile Estimator	Quantile Estimator	Quantile Estimator	Quantile Estimator
Taiwan Stock Exchange Corporation (TSEC)	0.0551	-0.0474	1.3719	-0.0442
	Tourism (TOURISM)	Tourism (TOURISM)	Cement (CEMENT)	Textile (TEXTILE)
	Quantile Estimator	Quantile Estimator	State Space Estimator	State Space Estimator

5.4 Conclusion

The investors often need to evaluate the risk in the stock market. Particularly, the global investors have to evaluate market for adjusting their portfolio. In this research, we use financial and econometric model base with time varying, State Space CAPM, Bayesian CAPM, Quantile regression CAPM. The alpha and beta values in ten Asian Stock Markets show the minimum and maximum values by aspect of CAPM model.

The highest time-varying alpha among portfolios in all Asian Stock Markets are presented by The Quantile estimator, with all values in the region of 0.0248 to 0.9206 and the lowest time-varying alpha among portfolios in all Asian Stock Markets with all values in the region of -0.0238 to -0.0706. The State Space estimator presents highest time-varying beta among portfolios in all Asian Stock Markets, with all values in the region of 1.2596 to 1.7443. The Quantile estimator presents the lowest time-varying beta among portfolios in all Asian Stock Markets, with all values in the region of -0.3396 to 0.7406. The State Space estimator and Bayesian estimator show the closely value in the median.

The test of symmetry testing compares estimates at the 2.5% and 97.25% quartile with the median specification. There are some sectors in Asian Stock markets showing individual coefficient restriction test values even less evidence of asymmetry. Except, The Stock Exchange of Thailand (SET) shows all values are less evidence of asymmetry in each sectors.

The key contribution of this paper is that we provide a financial and econometric model based on time varying, State Space CAPM, Bayesian CAPM, Quantile regression CAPM. In comparison with alpha and beta in CAPM model, our approach offer several advantages:

(1) The research offers initial knowledge about risk evaluation in time varying CAPM, which are required by global investors.

(2) The global investors have more information to evaluate their portfolio especially in ten Asian countries.

(3) We can compare the financial and econometrics model based on time varying estimators.