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Variance Decomposition and Sources of Betas in Taiwan Stock Market

In this two-year research project, we investigate the relative importance of the rational and irrational components in stock prices through the variance decomposition method of Campbell (1991). Before conducting empirical estimation, we would like to verify some important results of four key papers, Campbell and Shiller (1987,1989), Campbell (1991), and Campbell and Voulteenaho (2004), in order to make sure that we correctly understand the implications of the theoretical results in these papers. Also, we specifically link these results to the empirical vector regressions model for variance decomposition.

The variance decomposition of stock return starts from an approximate return equation first derived by Campbell and Shiller (1987, 1989). First, we can define the realized log gross return on the stock between time t and t+1, h_t, as follows.

$$h_t \equiv \log(P_{t+1} + D_t) - \log(P_t)$$

where P_t and D_t are the stock price and cash dividend at time t. Since h_t contains the log of the sum of the price and the dividend, this exact relationship is non-linear. However, it turns out that it can be well approximated by ξ_t, i.e., $h_t \approx \xi_t$, where ξ_t is defined as follows.

$$\xi_t \equiv k + \rho \log(P_{t}) + (1-\rho)\log(D_t) - \log(P_t)$$

$$= k + \rho P_{t+1} + (1-\rho) d_t - P_t$$

where the parameter ρ is close to but a little smaller than 1, and k is a constant term. We are able to prove this approximation as follows.

$$x = \log(P_{t+1} + D_t) = \log[(1 + \frac{D_t}{P_{t+1}})] = \log(1 + \frac{D_t}{P_{t+1}}) + \log P_{t+1}$$

$$y = \log(1 + \frac{D_t}{P_{t+1}}) = \log(1 + \frac{e^{\log D_t}}{e^{\log P_{t+1}}}) = \log(1 + \frac{e^{d_t}}{e^{P_{t+1}}}) = \log(1 + \exp(d_t - P_{t+1}))$$

$$h_t = \log P_{t+1} - \log(P_t) + \log(1 + \exp(d_t - \zeta_{t+1})) = \zeta_{t+1} - \zeta_t + \log(1 + \exp(d_t - \zeta_{t+1}))$$

According to the first-order Taylor's series,

$$f(X_{t+1}) \approx f(\overline{X}) + f'(\overline{X})(X_{t+1} - \overline{X}).$$

$$\log(1 + \exp(d_t - \zeta_{t+1})) \approx \log(1 + \exp(\overline{\alpha - \rho})) + \frac{1}{1 + \exp(\overline{\alpha - \rho})} \exp(\overline{\alpha - \rho})(d_t - \zeta_{t+1} - (\overline{\alpha - \rho}))$$

$$\approx \log\left(\frac{1}{\rho}\right) + (1-\rho)[d_t - \zeta_{t+1} - \log[(\exp(\overline{\alpha - \rho}) + 1) - 1]].$$

$$\approx -\log\rho + (1-\rho) d_t - (1-\rho)\zeta_{t+1} - (1-\rho)\log(\frac{1}{\rho} - 1)$$

$$\Rightarrow h_t \approx \zeta_{t+1} - \zeta_t - \log\rho + (1-\rho)d_t - \zeta_{t+1} + \rho\zeta_{t+1} - (1-\rho)\log\left(\frac{1}{\rho} - 1\right)$$

$$\approx \rho\zeta_{t+1} + (1-\rho)d_t - \zeta_t + \left[-\log\rho - (1-\rho)\log\left(\frac{1}{\rho} - 1\right)\right] = \xi_t$$

where $\rho = \frac{1}{1+\exp(\overline{\alpha - \beta})}$ and $k = -\log\rho - (1-\rho)\log\left(\frac{1}{\rho} - 1\right)$. Q. E. D.

After proving the approximate stock return equation, we can rewrite the equation and substitute h_t for ξ_t, getting

$$h_t \approx k + \rho\xi_{t+1} + (1-\rho)d_t - \xi_t$$
$$= k - \rho(d_t - \xi_{t+1}) + (d_{t-1} - \xi_t) + (d_t - d_{t-1})$$
$$= k - \rho\delta_{t+1} + \delta_t + \Delta d_t$$

If we impose the terminal condition $\lim_{j\to\infty} \rho^j \delta_{t+j} = 0$ and solve the equation forward, we can obtain the following approximation

$$\delta_t \approx \sum_{j=0}^{\infty} \rho^j (h_{t+j} - \Delta d_{t+j}) - \frac{k}{1-\rho}$$

which can be proved as follows.

$$\begin{cases} \delta_t \approx -k + \rho\delta_{t+1} + h_t - \Delta d_t \\ \approx [-k + (h_t - \Delta d_t)] + \rho[-k + (h_{t+1} - \Delta d_{t+1})] + \rho^2\delta_{t+2} \\ \approx [-k + (h_t - \Delta d_t)] + \rho[-k + (h_{t+1} - \Delta d_{t+1})] + \rho^2[-k + (h_{t+2} - \Delta d_{t+2})] \\ +\rho^3\delta_{t+3} \\ \approx [-k + (h_t - \Delta d_t)] + \rho[-k + (h_{t+1} - \Delta d_{t+1})] + \rho^2[-k + (h_{t+2} - \Delta d_{t+2})] \\ +\rho^{N-1}\left[-k + \left(h_{t+(N-1)} - \Delta d_{t+(N-1)}\right)\right] + \rho^N\delta_{t+N} \\ [-k(1 + \rho + \rho^2 + \cdots \rho^{N-1})] + \sum_{j=0}^{N-1} \rho^j (h_{t+j} - \Delta d_{t+j}) + \rho^N \delta_{t+N} \\ \text{Let } N \to \infty, \\ \delta_t \approx -k \lim_{N\to\infty} \frac{1-\rho^N}{1-\rho} + \lim_{N\to\infty} \sum_{j=0}^{N-1} \rho^j (h_{t+j} - \Delta d_{t+j}) + \lim_{N\to\infty} \rho^N \delta_{t+N} \\ \approx -k \cdot \frac{1}{1-\rho} + \sum_{j=0}^{\infty} \rho^j (h_{t+j} - \Delta d_{t+j}) \left(\because \lim_{N\to\infty} \rho^N = 0, 0 < \rho < 1, \lim_{N\to\infty} \rho^N \delta_{t+N} = 0 \text{ is assumed}\right) \end{cases}$$

Based upon the above approximate return equation, Campbell (1991) proceeds to decompose the variance of stock price as follows.

$$h_{t+1} = k + \delta_t - \rho\delta_{t+1} + \Delta d_{t+1}$$
$$E_t h_{t+1} = k + \delta_t - \rho E_t \delta_{t+1} + E_t \Delta d_{t+1}$$

$$\delta_t = \sum_{j=0}^{\infty} \rho^j (h_{t+1+j} - \Delta d_{t+1+j}) - \frac{K}{1-\rho}, \delta_{t+1} = \sum_{j=0}^{\infty} \rho^j (h_{t+2+j} - \Delta d_{t+2+j})$$

$$\begin{aligned} h_{t+1} - E_t h_{t+1} &= -\rho(\delta_{t+1} - E_t \delta_{t+1}) + E_{t+1}\Delta d_{t+1} - E_t \Delta d_{t+1} \\ &= -\rho(E_{t+1} - E_t)\delta_{t+1} + (E_{t+1} - E_t)\Delta d_{t+1} \\ &= (E_{t+1} - E_t)\sum_{j=0}^{\infty} \rho^{j+1} (\Delta d_{t+2+j} - h_{t2+j}) + (E_{t+1} - E_t)\Delta d_{t+1} \end{aligned}$$

$$\begin{aligned} &= (E_{t+1} - E_t)\sum_{j=0}^{\infty} \rho^j (\Delta d_{t+1+j} - h_{t+1+j}) + (E_{t+1} - E_t)\Delta d_{t+1} \\ &= (E_{t+1} - E_t)\sum_{j=0}^{\infty} \rho^j (\Delta d_{t+1+j}) - (E_{t+1} - E_t)\sum_{j=1}^{\infty} \rho^j h_{t+1+j} \end{aligned}$$

Here E_t denotes an expectation formed at the end of period t , and Δ denotes a 1-period backward difference. The above equation is best thought of as a consistency condition for expectations. If the unexpected stock return is negative, then either expected future dividend growth must be lower, or expected future stock returns must be higher, or both.

We further define $\nu_{h,t+1}$ to be the unexpected component of the stock return h_{t+1} :

$$\nu_{h,t+1} \equiv h_{t+1} - E_t h_{t+1}$$

We also define $\eta_{d,t+1}$ to represent news about cash flows:

$$\eta_{d,t+1} \equiv (E_{t+1} - E_t)\sum_{j=0}^{\infty} \rho^j \Delta d_{t+1+j}$$

We finally define $\eta_{h,t+1}$ as follows.

$$\eta_{h,t+1} \equiv (E_{t+1} - E_t)\sum_{j=1}^{\infty} \rho^j \Delta h_{t+1+j}$$

According to these definitions, we can rewrite the above equation as

$$\nu_{h,t+1} = \eta_{d,t+1} - \eta_{h,t+1}$$

To assure that we fully understand this variance decomposition, we also verify the results for an AR(1) case in Campbell (1991). Let us first define u_{t+1} to be the innovation at time $t+1$ in the one-period-ahead expected return: $u_{t+1} \equiv (E_{t+1} - E_t)h_{t+2}$. If the expected return follows a univariate time series process, then $\eta_{t,t+1}$ is an exact function of u_{t+1}. The AR(1) case is

$$E_{t+1}h_{t+2} = \phi E_t h_{t+1} + u_{t+1}$$

which implies

$$\eta_{h,t+1} = \frac{\rho u_{t+1}}{1-\rho\phi} \tag{4}$$

$$E_t u_{t+1} = E_t E_{t+1} h_{t+2} - E_t E_t h_{t+2} = E_t h_{t+2} - E_t h_{t+2} = 0$$

$$E_t E_{t+1} h_{t+2} = \phi h_{t+1} + E_t u_{t+1} = \phi E_t h_{t+1} \longrightarrow E_t h_{t+2} = \phi E_t h_{t+1}$$

$$u_{t+1} = (E_{t+1} - E_t)h_{t+2}$$

$$\eta_{h,t+1} = \rho(E_{t+1} - E_t)h_{t+2} + \rho^2(E_{t+1} - E_t)h_{t+3} + \rho^3(E_{t+1} - E_t)h_{t+4} + \ldots\ldots$$

$$E_{t+1}E_{t+2}h_{t+3} = E_{t+1}h_{t+3} = \phi E_{t+1}E_{t+1}h_{t+2} + \cancelto{0}{E_{t+1}u_{t+2}} = \phi E_{t+1}h_{t+2}$$

$$(\because u_{t+2} = (E_{t+2} - E_{t+1})h_{t+3}, E_{t+1}u_{t+2} = E_{t+1}h_{t+3} - E_{t+1}h_{t+3} = 0)$$

$$E_t E_{t+2} h_{t+3} = E_t h_{t+3} = \phi E_t E_{t+1} h_{t+2} = \phi E_t h_{t+2} + \cancelto{0}{E_t u_{t+2}}$$

$$\longrightarrow (E_{t+1} - E_t)h_{t+3} = \phi(E_{t+1} - E_t)h_{t+2} = \phi u_{t+1}$$

$$u_{t+3} = (E_{t+3} - E_{t+2})h_{t+4}, E_{t+3}h_{t+4} = \phi E_{t+2}h_{t+3} + u_{t+3}$$

$$E_{t+1}E_{t+3}h_{t+4} = E_{t+1}h_{t+4} = \phi E_{t+1}h_{t+3} + \cancelto{0}{E_{t+2}u_{t+3}}$$

$$E_t E_{t+3} h_{t+4} = E_t h_{t+4} = \phi E_t h_{t+3} + \cancelto{0}{E_{t+2}u_{t+3}}$$

$$\longrightarrow (E_{t+1} - E_t)h_{t+4} = \phi(E_{t+1} - E_t)h_{t+3} = \phi^2 u_{t+1}$$

$$= \eta_{h,t+1} = \rho u_{t+1} + \rho^2 \phi u_{t+1} + \rho^3 \phi^2 u_{t+1} + \ldots\ldots$$

$$= \rho u_{t+1}(1 + \rho\phi + (\rho\phi)^2 + \ldots\ldots) = \frac{\rho u_{t+1}}{1-\rho\phi} \qquad \text{Q.E.D.}$$

Since ρ is a number very close to one, this equation says that a 1% increase in the expected return today is associated with a capital less of about 2% if the AR coefficient is 0.5.

($\rho \approx 1 \Rightarrow \eta_{h,t+1} \approx \frac{u_{t+1}}{1-\phi}$ $\phi = 0.5, u_{t+1} = 1\% \uparrow \Rightarrow \eta_{k,t+1} \approx \frac{1\%}{0.5} \approx 2\%$)

$\Rightarrow$ where $\eta_{d,t+1}$ is fixed in (2), $\nu_{h,t+1} \downarrow 2\%$

Equation(4) can also be used to calculate the ratio of the variance of news about future returns to the overall variance of unexpected returns. If the AR(1) model holds this ratio satisfies

$$\frac{Var(\eta_{h,t+1})}{Var(u_{h,t+1})} \approx (1-\phi^2)\left(\frac{\rho}{1-\rho\phi}\right)^2\left(\frac{R^2}{1-R^2}\right) \approx \left(\frac{1+\phi}{1-\phi}\right)\left(\frac{R^2}{1-R^2}\right)$$

$$h_{t+1} = E_t h_{t+1} + u_{h,t+1}, Var(h_{t+1}) = Var(E_t h_{t+1}) + Var(u_{h,t+1})$$

$$\Rightarrow Var(h_{t+1}) = \frac{Var(u_t)}{1-\phi^2} + Var(u_{h,t+1})$$

$$\because E_t h_{t+1} = \phi E_t h_t + u_t$$

$$= \phi^2 E_{t-2} h_{t-1} + u_t + \phi u_{t-1}$$

$$= u_t + \phi u_{t-1} + \cdots$$

$$\therefore Var(E_t h_{t+1}) = \frac{Var(u_t)}{1-\phi^2}$$

$$\Rightarrow Var(h_{t+1}) = \frac{Var(u_{h,t+1})}{1-R^2} = \frac{Var(u_t)}{1-\phi^2} + Var(u_{h,t+1}) \because R^2 = 1 - \frac{Var(u_{h,t+1})}{Var(h_{t+1})}$$

$$\Rightarrow Var(u_{h,t+1}) = \frac{1-R^2}{R^2} \cdot \frac{Var(u_t)}{1-\phi^2}$$

$$\Rightarrow \frac{Var(\eta_{h,t+1})}{Var(u_{h,t+1})} = (\frac{R^2}{1-R^2} \times \frac{1-\phi^2}{Var(u_t)}) \times (\frac{\rho}{1-\rho\phi})^2 Var(u_{t+1}) \because u_t \sim iid$$

$$= (1-\phi^2)(\frac{\rho}{1-\rho\phi})^2 (\frac{R^2}{1-R^2})$$

$$\approx (1-\phi^2)\frac{1}{(1-\phi)^2}(\frac{R^2}{1-R^2}) \because \rho \approx 1$$

$$\approx (\frac{1+\phi}{1-\phi})(\frac{R^2}{1-R^2})$$

where R^2 is the reaction of the variances of stock returns where is predictable.

For many purposes it is more natural to work with excess stock returns over some short-term interest rate. If the log real interest ratio is r_{t+1}, then the excess return is just

$$e_{t+1} \equiv h_{t+1} - r_{t+1}$$

Since e_{t+1} is just the difference between two continuously compounded real returns, the price debates cancel and it can equally well be measured as the difference between two log nominal returns.

$$h_{t+1} - E_t h_{t+1} = (E_{t+1} - E_t)\sum_{j=0}^{\infty} \rho^j \Delta d_{t+1+j} - (E_{t+1} - E_t)\sum_{j=1}^{\infty} \rho^j h_{t+1+j}$$

$$\Rightarrow e_{t+1} - E_t e_{t+1} = (E_{t+1} - E_t)\sum_{j=0}^{\infty} \rho^j \Delta d_{t+1+j} - (E_{t+1} - E_t)\sum_{j=1}^{\infty} \rho^j (e_{t+1+j} + r_{t+1+j})$$

$$= (E_{t+1} - E_t)\sum_{j=0}^{\infty}\rho^j \Delta d_{t+1+j} - (E_{t+1} - E_t)\sum_{j=1}^{\infty}\rho^j r_{t+1+j} - (E_{t+1} - E_t)\sum_{j=1}^{\infty}\rho^j e_{t+1+j})$$

Or in more compact notation,

$$u_{e,t+1} = \eta_{d,t+1} - \eta_{r,t+1} - \eta_{e,t+1}$$

If the first two terms on the RHS are treated as a composite residual, then this equation has exactly the same form as $v_{h,t+1} = \eta_{d,t+1} - \eta_{h,t+1}$. Alternatively, one can work with the three-way decomposition of excess returns given above. So far, we have verified the most relevant theoretical results in Campbell and Shiller (1987, 1989), Campbell (1991), and Campbell and Vuolteenaho (2004). We are therefore confident that we fully understand the variance decomposition model employed in the subsequent empirical analysis.

The following tables summarize our empirical results.

Table 1: Descriptive Statistics and Correlation of the VAR State Variables

Variables	Mean	Median	Std	Min	Max	ACF
ER	0.00479	0.00654	0.11151	(0.49678)	0.40308	0.06632
M1B	0.12413	0.09565	0.12152	(0.09630)	0.54030	0.97571
PE	3.56830	3.56580	0.36714	4.52930	5.28560	0.94833
VS	1.19100	1.12790	0.37611	0.43528	2.21220	0.96590

Correlation	ER	M1B	PE	VS
ER	1.00000	0.20180	0.17516	(0.04510)
M1B	0.20180	1.00000	0.25834	(0.32655)
PE	0.17516	0.25834	1.00000	(0.04153)
VS	(0.04510)	(0.32655)	(0.04153)	1.00000

The sample period cover from 1985:02 to 2008:03. There are 278 monthly data points. ER is TAIEX excess market return against risk-free-rate. M1B is M1B growth rate (year-to-year). PE is log of the 36 months smoothed price-earning-ratio. VS is spread of log price-book-ratio between growth stocks and value stocks in TAIEX. “Std” means sample standard deviation and “Acf” means the first-order autocorrelation of each variable.

Table 2-1: Coefficients of VAR

Variables	C	ER(t)	M1B(t)	PE(t)	VS(t)	R-square	F Statistic
ER(t+1)	0.18467	0.05594	0.19650	(0.05709)	(0.00063)	0.06496	4.72
	<0.06905>	<0.06041>	<0.05982>	<0.01865>	<0.01842>		
M1B(t+1)	0.05643	0.02738	0.98588	(0.01518)	(0.00095)	0.95878	1,581.80
	<0.01580>	<0.01382>	<0.01369>	<0.00427>	<0.00422>		
PE(t+1)	0.18248	0.05467	0.17433	0.93792	0.01412	0.91302	713.78
	<0.06919>	<0.06053>	<0.05994>	<0.01869>	<0.01846>		
VS(t+1)	0.03033	(0.11991)	(0.03207)	0.00589	0.96127	0.93602	994.90
	<0.06087>	<0.05326>	<0.05274>	<0.01645>	<0.01624>		

Table 2-2: Coefficients of VAR (Bootstrap)

Variables	C	ER(t)	M1B(t)	PE(t)	VS(t)
ER(t+1)	0.26352	0.05399	0.25738	(0.08063)	(0.00276)
	<0.12917>	<0.07550>	<0.11428>	<0.03361>	<0.03982>
M1B(t+1)	0.06676	0.02973	0.96725	(0.01704)	(0.00230)
	<0.02700>	<0.01698>	<0.02891>	<0.00697>	<0.00912>
PE(t+1)	0.26111	0.05345	0.23434	0.91387	0.01381
	<0.13057>	<0.07578>	<0.11403>	<0.03399>	<0.03973>
VS(t+1)	0.09058	(0.11608)	(0.04383)	0.00254	0.92192
	<0.12062>	<0.06862>	<0.11130>	<0.03046>	<0.03821>

The table shows the parameter estimates for a first-order VAR model. ER is TAIEX excess market return against risk-free-rate. M1B is M1B growth rate (year-to-year). PE is log of the 36 months smoothed price-earning-ratio. VS is spread of log price-book-ratio between growth stocks and value stocks in TAIEX. The upper table are the OLS estimated parameters and standard error with R square and F statistic of VAR model in the last two columns. We also report the result estimated by Bootstrap from 2500 simulations in lower table.

Table 3: Covariance Matrix of News Term

News	Ncf	Ndr
Ncf	0.00215	0.00338
Ndr	0.00338	0.01628

Table 4-1: Map Function of the VAR State Shocks and News Term

	Map Ncf	Map Ndr
ER	1.07280	0.07282
M1B	0.97809	0.97809
PE	(1.18440)	(1.18440)
VS	(0.42602)	(0.42602)

Table 4-2: Map Function of the VAR State Shocks and News Term (Bootstrap)

	Map Ncf	Map Ndr
ER	1.04450	0.04451
	<0.52000>	<0.52000>
M1B	0.70328	0.70328
	<5.65100>	<5.65100>
PE	(1.08250)	(1.08250)
	<1.56500>	<1.56500>
VS	(0.26607)	(0.26607)
	<1.19130>	<1.19130>

Here, "Ncf" and "Ndr" mean cash-flow news and discount-rate news of TAIEX market return. The upper table is the correlation of news term with standard deviations of Bootstrap estimate on the diagonal. The middle and lower tables are the weighted function that maps the innovation of state variables to two news terms. The middle table is estimated from OLS and the lower table is the Bootstrap estimated parameters and standard error.

Table 5-1: Correlation Matrix of the VAR State Shocks and News Term

Innovations	ER	M1B	PE	VS	Ncf	Ndr
ER	0.10801	0.09759	0.98109	0.09652	(0.24677)	(0.93605)
M1B	0.09759	0.02472	0.13344	0.04430	0.35789	0.04734
PE	0.98109	0.13344	0.10823	0.04598	(0.28340)	(0.93335)
VS	0.09652	0.04430	0.04598	0.09522	(0.73827)	(0.34975)
Ncf	(0.24677)	0.35789	(0.28340)	(0.73827)	0.04633	0.57197
Ndr	(0.93605)	0.04734	(0.93335)	(0.34975)	0.57197	0.12761

Table 5-2: Correlation Matrix of the VAR State Shocks and News Term (Bootstrap)

Innovations	ER	M1B	PE	VS	Ncf	Ndr
ER	0.10580	0.10636	0.98050	0.09637	(0.08563)	(0.94507)
	<0.00932>	<0.10392>	<0.00432>	<0.11735>	<0.28448>	<0.05146>
M1B	0.10636	0.02423	0.14204	0.04444	0.34856	0.01591
	<0.10392>	<0.00189>	<0.10336>	<0.07642>	<0.26047>	<0.14599>
PE	0.98050	0.14204	0.10603	0.04633	(0.15891)	(0.94832)
	<0.00432>	<0.10336>	<0.00950>	<0.11623>	<0.27541>	<0.05491>
VS	0.09637	0.04444	0.04633	0.09338	(0.49514)	(0.25855)
	<0.11735>	<0.07642>	<0.11623>	<0.00641>	<0.27590>	<0.16148>
Ncf	(0.08563)	0.34856	(0.15891)	(0.49514)	0.04279	0.37716
	<0.28448>	<0.26047>	<0.27541>	<0.27590>	<0.20409>	<0.28175>
Ndr	(0.94507)	0.01591	(0.94832)	(0.25855)	0.37716	0.12124
	<0.05146>	<0.14599>	<0.05491>	<0.16148>	<0.28175>	<0.20162>

The upper table reports the correlation matrix of innovation from VAR estimate and news terms with standard deviations of Bootstrap estimate on the diagonal. The lower table is correlation matrix of innovation with standard errors from Bootstrap in brackets.

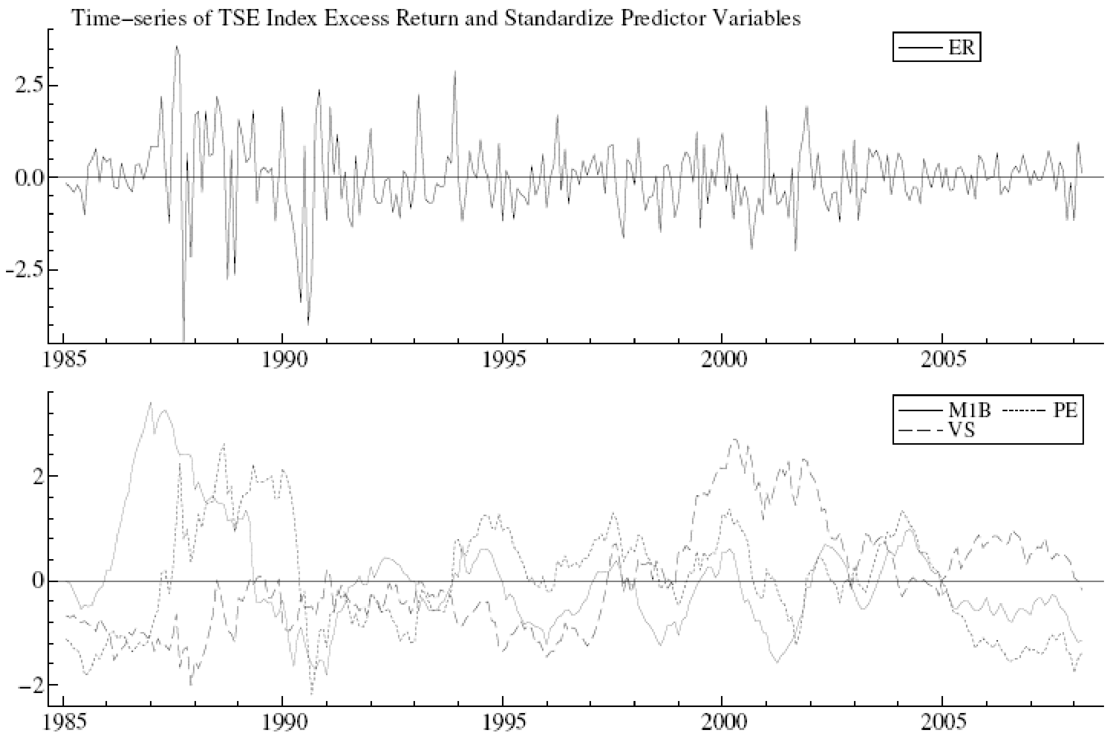
Table 6: Correlation Matrix of the VAR State Shocks and News Term

Main-industry		Beta_Ncf	Beta_Ndr	Beta_M
Cement/Glass/Ceramics	Mar-85	(0.02128)	0.76214	0.74085
Foods	Mar-85	(0.06094)	0.93979	0.87886
Plastics/Chemicals/Rubber	Mar-85	(0.10667)	0.98771	0.88104
Textiles	Mar-85	(0.06545)	1.03767	0.97222
Machinery/Appliance/Cable/Electronics	Mar-85	(0.20833)	1.25343	1.04510
Paper/Pulp	Mar-85	(0.06737)	1.01065	0.94328
Construction	Mar-85	(0.03912)	1.07451	1.03539
Finance	Jan-87	(0.15130)	1.18433	1.03304
Sub-industry		Beta_Ncf	Beta_Ndr	Beta_M
Cement	Feb-95	0.20521	0.47588	0.68109
Plastics	Feb-95	(0.03605)	0.87022	0.83416
Machinery	Feb-95	(0.00027)	0.81214	0.81187

Appliance/Cable	Feb-95	(0.01750)	1.09818	1.08068
Chemicals	Feb-95	0.05200	0.78636	0.83836
Glass/Ceramics	Feb-95	0.07185	0.53890	0.61075
Steel	Feb-95	0.02789	0.63641	0.66430
Rubbers	Feb-95	0.02761	0.80821	0.83582
Automobile	Feb-95	0.11005	0.39680	0.50686
Electronics	Feb-95	(0.44856)	1.71108	1.26252
Transportation	Feb-95	0.07635	0.61750	0.69385
Tourism	Feb-95	0.22832	0.38067	0.60899
Retail	Feb-95	0.03335	0.67873	0.71208
Others	Feb-95	(0.05074)	0.92793	0.87719

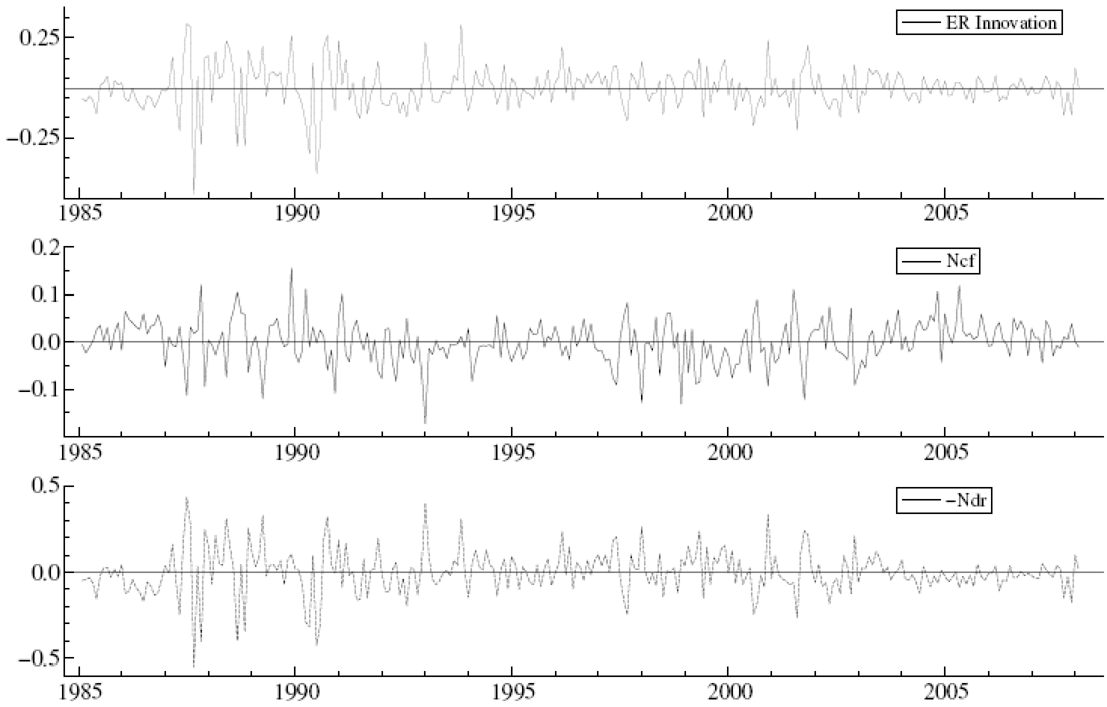
"Beta_Ncf" is the cash-flow beta that means the sensitivity of portfolio return to market cash flow news. "Beta_Ndr" is the discount-rate beta that means the sensitivity of portfolio return to market discount rate news. "Beta_M" is sum of "Beta_Ncf" and "Beta_Ndr" and it is also the market beta that means the sensitivity of portfolio return to unexpected excess market return. The number in parentheses is negative. We use the TAIEX to calculate the market return. The industries are classified by Taiwan Stock Exchange Corporation. We use the industrial indices for our portfolios. Main-industry indices cover from 1985:03 (Finance industry index is from 1987:01 and Sub-industry indices cover from 1995:02.)

Figure 1: Time Series of Standardized TAIEX Excess Return and State Variables



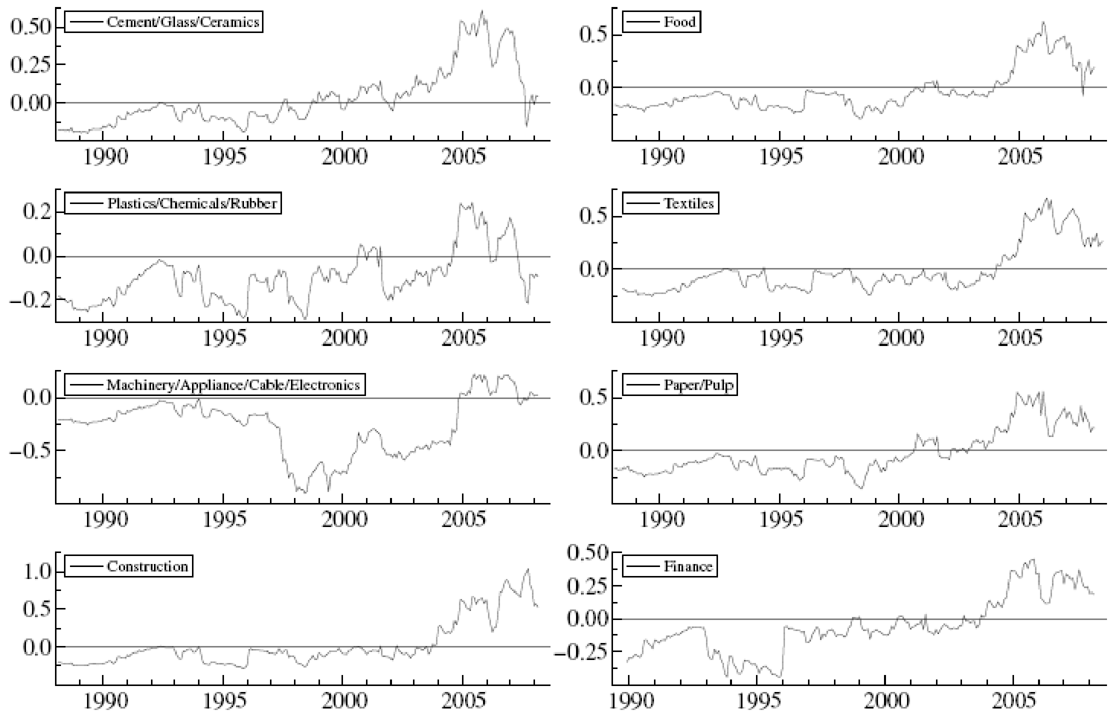
The sample period is from Feb. 1985 to Mar. 2008. ER is the excess market return. M1B is the year-to-year monthly growth rate of M1B. PE is the log of the 36-month smoothed price-to-earnings ratio. VS is the spread of log price-to-book ratio between the growth stocks and the value stocks. All variables have been standardized.

Figure 2: The Time Series of Cash Flow News and Discount Rate News



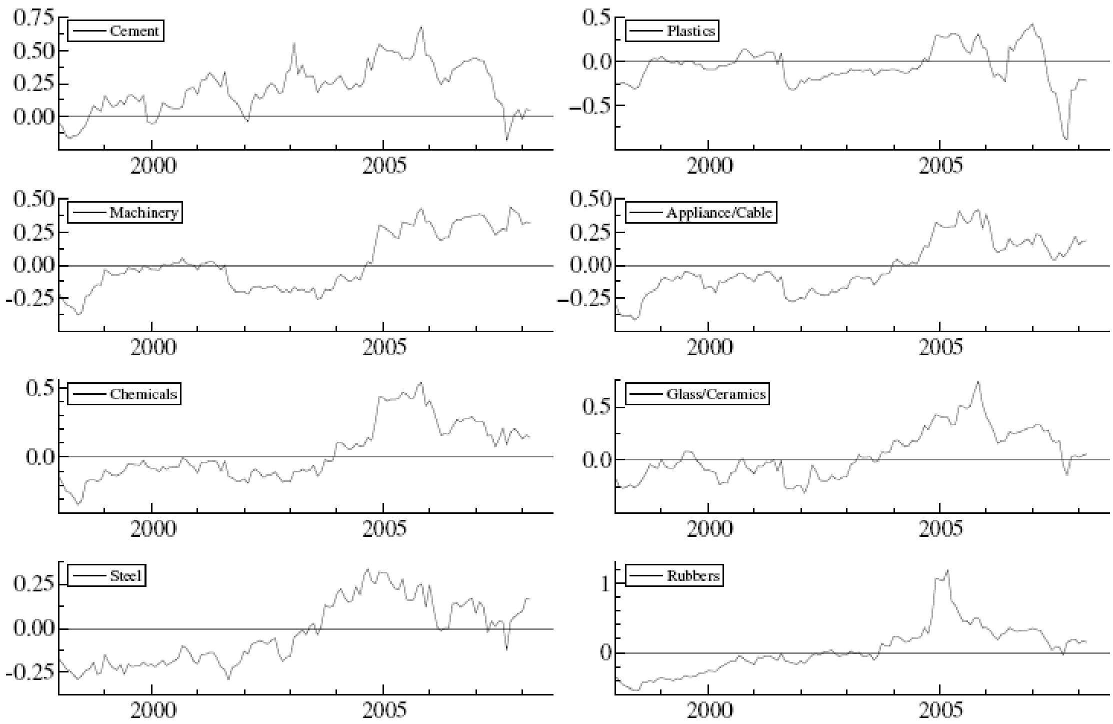
The sample period is from Feb. 1985 to Mar. 2008. ER is the excess market return. Ncf and Ndr are the cash flow news and discount rate news of ER respectively. The negative Ndr presents good discount rate news for ER.

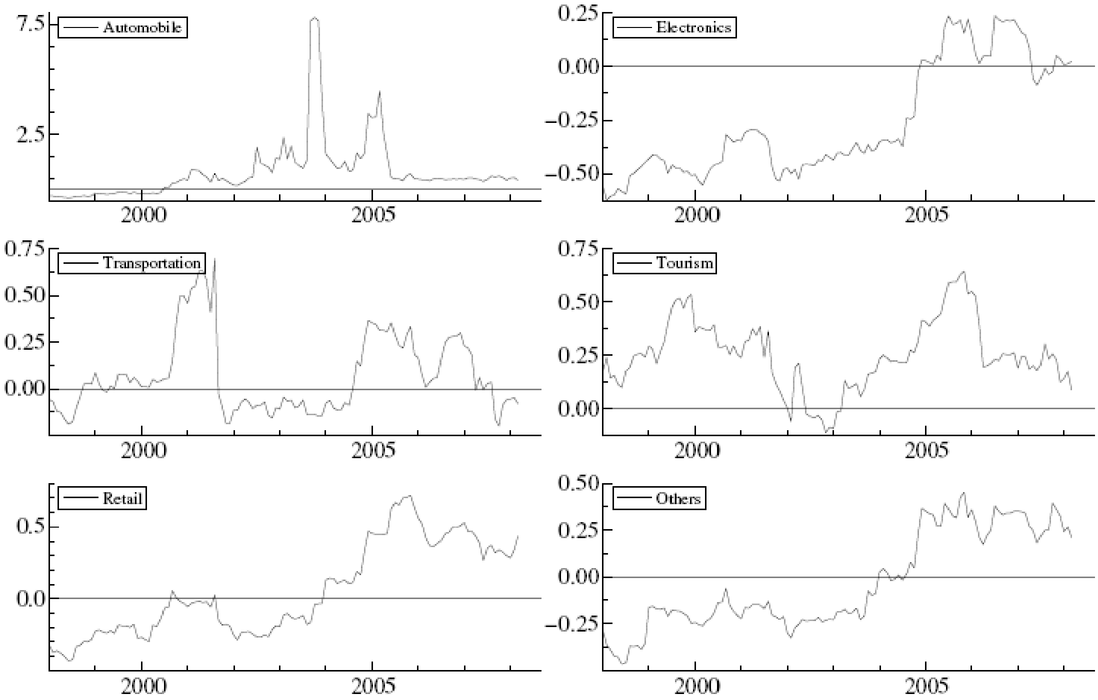
Figure 3: The Time Series of the Cash-Flow Beta for Industrial Indices



The cash flow betas for eight industrial indices are calculated based on 36-month rolling regressions during the sample period from Jul. 1985 to Mar. 2008.

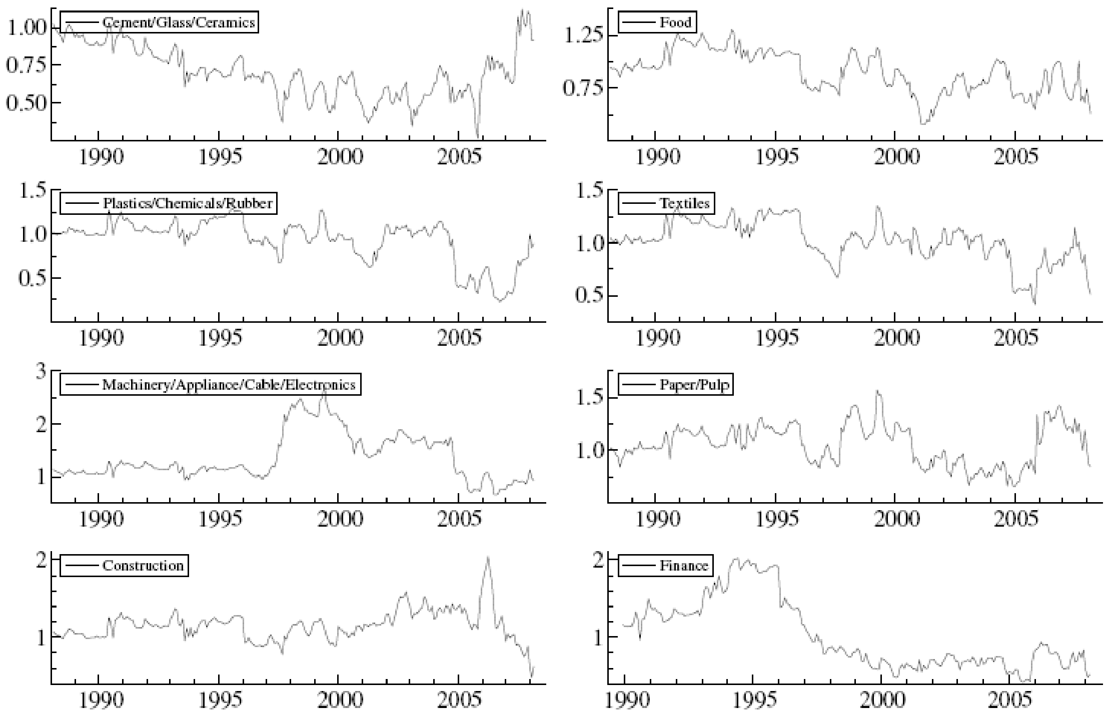
Figure 4: The Time Series of the Cash-Flow Beta for New Sub-Industry Indices





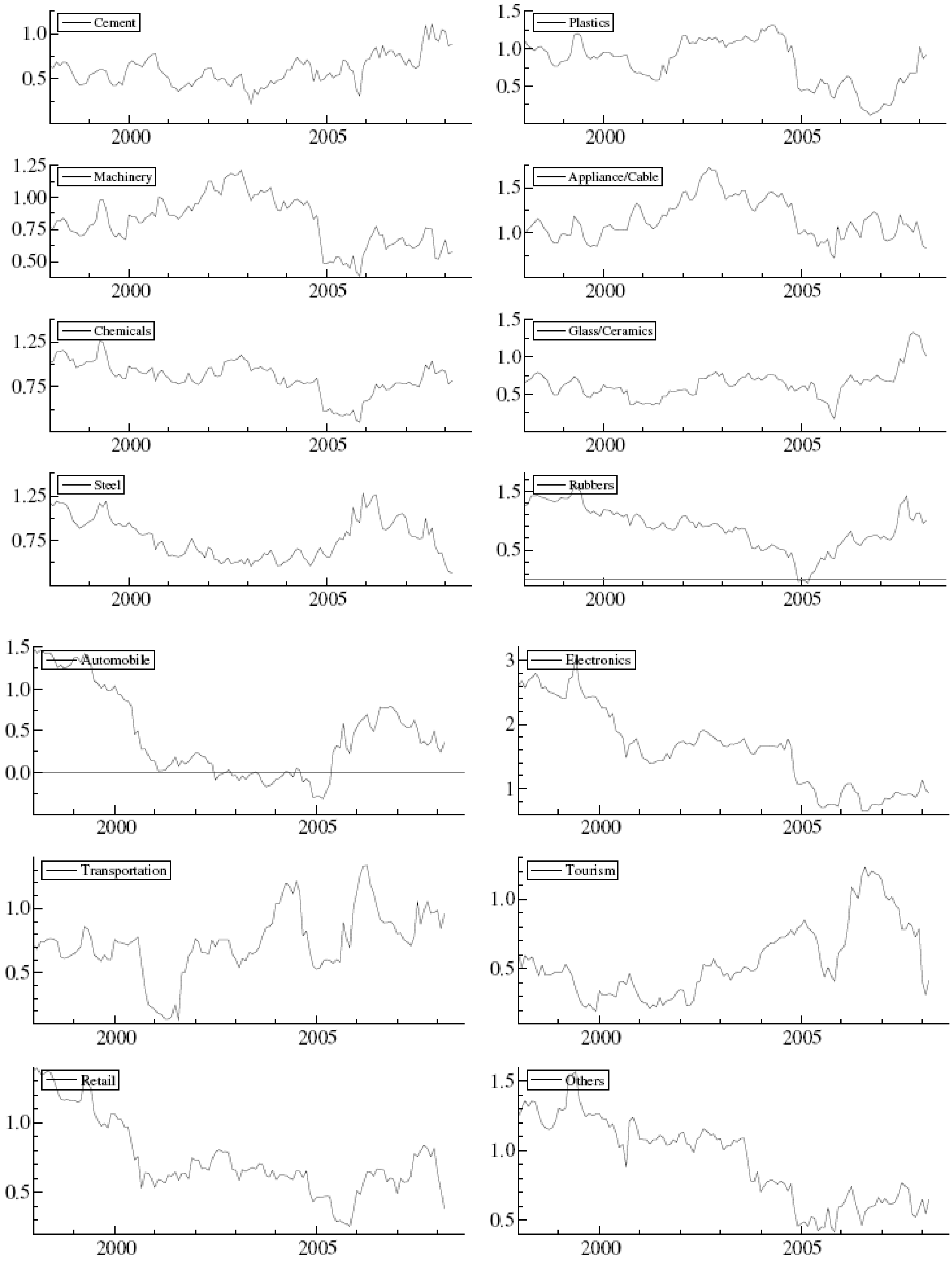
The cash flow betas for fourteen sub-industry indices are calculated based on 36-month rolling regressions during the sample period from Jul. 1985 to Mar. 2008.

Figure 5: The Time Series of the Discount-Rate Beta for Industrial Indices



The discount-rate betas for eight industrial indices are calculated based on 36-month rolling regressions during the sample period from Jul. 1985 to Mar. 2008.

Figure 6: The Time Series of the Discount-Rate Beta for New Sub-Industry Indices



The discount rate betas for fourteen sub-industry indices are calculated based on 36-month rolling regressions during the sample period from Jul. 1985 to Mar. 2008.

出席國際學術會議心得報告

計畫編號	NSC-93-2416-H-004-039
計畫名稱	台灣期貨市場之市場結構與市場品質
出國人員姓名 服務機關及職稱	郭維裕，國立政治大學國際經營與貿易學系，副教授
會議時間地點	日本橫濱市
會議名稱	AsianFA-NFA 2008
發表論文題目	The Effect of Trading Mechanism on the Market Quality of Taiwan Futures Exchange

一、參加會議經過

會議期間為 2008 年 7 月 6 日到 2008 年 7 月 9 日。我被安排在最後一天的最後一場進行報告。文章評論人為 Thomas McInish 教授，他個人在市場微結構研究方面頗負盛名。他也給了這篇文章許多具有建設性的建議，並鼓勵我將這篇文章投稿到 J. Futures Markets.

二、與會心得

這次的會議經驗相當豐富有趣，讓我見識到亞洲以致於全世界的財務學術界的活力與熱情，也更激勵個人在財務學術界進行更深度研究的強烈動機。