行政院國家科學委員會專題研究計畫　成果報告

效用函數，風險趨避與避險分析：理論模型與應用(I)

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計畫主持人：李正福
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行政院國家科學委員會補助專題研究計畫 - 成果報告

計畫名稱: 效用函數、風險趨避與避險分析: 理論模型與應用

Utility Function, Risk Aversion and Hedging Analysis: Theory Methods and Application

計畫類別：V 個別型計畫　　□ 整合型計畫

計畫編號：NSC　91-2416-H-009-018

執行期間：91 年 8 月 1 日至 92 年 7 月 31 日

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成果報告類型(依經費核定清單規定繳交)：V 精簡報告　□完整報告

本成果報告包括以下應繳交之附件：

□赴國外出差或研習心得報告一份

□赴大陸地區出差或研習心得報告一份

V 出席國際學術會議心得報告及發表之論文各一份

□國際合作研究計畫國外研究報告書一份

處理方式：除產學合作研究計畫、提升產業技術及人才培育研究計畫、列管計畫及下列情形者外，得立即公開查詢

□ 涉及專利或其他智慧財產權，□一年□二年後可公開查詢

執行單位：國立交通大學財務金融所

中　華　民　國　　92 年　　10 月　　27 日

I. 中英文摘要及關鍵詞(keywords)

(一) 中文摘要

財務理論乃依據 utility function 和 risk aversion 理論導出。依據 utility function 和 risk aversion 理論可導出的理論包括 capital asset pricing model、option pricing model、與避險理論。因此，在這個研究計劃的第一階段時，我們深入探討 Gibbons and Brown 於 1985 年所提出的 Risk Aversion parameter 的估計方法，並更進一步擴展其理論與實務應用的範疇。在第二階段時，我們從文獻方面著手，探討各種可應用於 hedging 和估計 hedge ratio 的 utility functions。同時也探討各種不同的 hedge ratio models 與其估計方法。最後，本計劃透過結合實際市場資料的方法，將 hedging theory 和 hedge ratio 的估計納入成為評估 Risk Aversion parameter 的重要環節。在這個計劃中，我們應用到的實際市場資料包括市場投資報酬率(market rate of return)，無風險報酬率（risk-free rate)，三種外匯現貨及期貨的資料（futures data of foreign exchange)，和 S&P 500 指數現貨及期貨資料。總而言之，這個研究乃理論與實務並重的研究計畫。

（二）計畫英文摘要。

Finance theory is derived in accordance with utility function and risk aversion theory. The major finance theory based upon utility function and risk aversion theory includes capital asset pricing model, option pricing model, and hedging theory. In this research project, we firstly extend the risk aversion parameter estimation methods proposed by Gibbons and Brown (1985). Secondly, we review alternative utility functions applied in hedging and hedge ratio estimation and also alternative hedge ratio models and their estimation methods. Finally, we integrate the estimate of risk aversion parameter with hedging theory and hedge ratio estimation in terms of real-world data. The data used in this research include market rate of return, risk-free rate, and the spot and futures data of foreign exchange, and the spot and futures data of S&P 500 index. In sum, this research has contributed theoretically and empirically in financial research.

關鍵詞：Utility Function , Risk Aversion, Bayesian Approach, Hedge Ratio , Market Rate of Return, Index Futures, Foreign Exchange Futures, Investment Horizon

II. 報告內容

The main results of this project include two parts as follows:

Part A: Econometric Approaches for Utility-Based Asset Pricing Model: Theory and Empirical Results

Abstract

The Journal of Finance has published an important paper entitled "A Simple Econometric Approach for Utility-Based Asset Pricing Model" by Brown and Gibbon (1985). The main purpose of this paper is to extend the research of Brown and Gibbons (1985) and Karson et al. (1995) in estimating the relative risk aversion (RRA) parameter β in utility-based asset pricing model. First, we review the distributions of RRA parameter estimate $\hat{\beta}$. Then, a new method to the distribution of $\hat{\beta}$ is derived, and a Bayesian approach for the inference of β is proposed. Finally, empirical results are presented by using market rate of return and riskless rate data during the period December 1926 through December 2001.

A. Introduction

Brown and Gibbons (1985) and Karson, Cheng, and Lee (1995) have proposed different methods for estimating the relative risk aversion parameter. This paper first proposes a new approach to deal with the statistical distribution of the relative risk aversion estimator derived by Karson, Cheng, and Lee. In addition, a Bayesian statistical methodology is used to construct the interval estimation for the relative risk aversion. Furthermore, it also examines the statistical distribution of excess market rate of return in accordance with Box and Cox (1964) transformation to determine whether the lognormal distribution is suitable for the data at hand in estimating the relative risk aversion.

In section B, an exact distribution for parametric estimation of the relative risk aversion (RRA) is examined in detail. In section C an alternative method to the distribution of $\hat{\beta}$ is explored. Section D proposed a Bayesian approach for the inference of □. Empirical results are presented in section E. Finally, section F summarized the results of the paper.

B. A brief literature review of RRA Estimation

Let R_M be the market rate of return, R_f be the riskless rate of return, $X=(1+R_M)/(1+R_f)$ and $Y=\log X$. Furthermore, let $\{R_{Mt}\}$ and $\{R_{ft}\}$, t=1,…, T, be the observed samples. Then the sample mean and the sample variance of excess market rate of return are

$$\overline{Y} = \overline{\log X} = \frac{\sum_{t=1}^{T} Y_t}{T}, \qquad (1)$$

and

$$S^2 = \frac{\sum_{t=1}^{T} (Y_t - \overline{Y})^2}{T-1}. \qquad (2)$$

Assuming normality for Y with mean μ and variance σ^2, Brown and Gibbons (1985) established the following relative risk aversion (*RRA*),

$$\beta = \frac{\mu}{\sigma^2} + \frac{1}{2}. \qquad (3)$$

Following Brown and Gibbons, a natural maximum likelihood estimator for β is

$$\hat{b} = \frac{\overline{Y}}{S^2} + \frac{1}{2}. \qquad (4)$$

Using asymptotic theory, Brown and Gibbons have derived the variance of $\sqrt{T}\hat{b}$ as:

$$Var\{\sqrt{T}\hat{b}\} = \frac{2[E\{\ln \tilde{x}_t\}]^2 + Var\{\ln \tilde{x}_t\}}{[Var\{\ln \tilde{x}_t\}]^2}. \qquad (5)$$

Alternatively, following Karson *et al.* (1995), the minimum variance unbiased (MVU) estimator of β is

$$\hat{\beta} = \frac{(T-3)\overline{Y}}{(T-1)S^2} + \frac{1}{2}. \qquad (6)$$

In case the normality assumption for Y is violated, the estimator $\hat{b}$ can be inconsistent, as pointed out by Brown and Gibbons. In order to remedy this possible shortcoming, they proposed a method of moment estimator which is the solution of

$$f(b) = \frac{1}{T}\sum_{t=1}^{T} (X_t - 1)X_t^{-b} = 0\ , \qquad (7)$$

with the asymptotic variance

$$Var(\sqrt{T}b) = \frac{E\{[(X_t - 1)X_t^{-\beta}]^2\}}{[E\{(X_t - 1)X_t^{-\beta} \log X_t]^2}\ , \qquad (8)$$

where β is the relative risk aversion.

Karson *et al*. (1995) have derived the exact distribution of $\hat{\beta}$, which is defined in Equation (6), as:

$$f(\hat{\beta}) = \frac{c_1}{v}\sum_{r=0}^{\infty} \Gamma\left(\frac{2r+T+1}{4}\right)\frac{1}{r!}\cdot\left(\frac{2T\sigma^2(\beta - 1/2)(\hat{\beta} - 1/2)((T-1)/(T-3) - (T-1)}{\sqrt{2T}\sigma(\hat{\beta} - 1/2)((T-1)/(T-3))}\right)^r,$$

$$-\infty < \hat{\beta} < \infty, \sigma > 0, T > 3, -\infty < \beta < \infty$$

(9)

where

$$c_1 = \frac{e^{-T(\beta-1/2)^2\sigma^2/2}}{\sqrt{\pi}\,2^{\frac{T+3}{4}}\left(\frac{\sigma\sqrt{T}}{T-1}\right)^{\frac{T-1}{2}}\Gamma\left(\frac{T-1}{2}\right)}\frac{(T-1)}{(T-3)}, \qquad (10)$$

$$v = \left[(\hat{\beta}-1/2)\left(\frac{T-1}{T-3}\right)\right]^{\frac{T+1}{2}}. \qquad (11)$$

The exact distribution presented in the above equation is expressed in terms of an infinite sum, therefore, it is not easy to compute in practice.

C. A new method to the distribution of $\hat{\beta}$

The exact distribution of $\hat{\beta}$ obtained by Karson et al. (1995) as given in Equation (9) is not easy to compute in practice. We will next propose a new method to the distribution of $\hat{\beta}$. We first note that the relative risk aversion estimator $\hat{\beta}$, as defined in Equation (6), can be rewritten as:

$$\hat{\beta} = \frac{(T-3)\bar{Y}}{(T-1)S^2} + \frac{1}{2} = \frac{(T-3)\bar{Y}/\sigma^2}{(T-1)S^2/\sigma^2} + \frac{1}{2} = \frac{(T-3)\bar{Y}/\sigma^2}{W} + \frac{1}{2}, \qquad (12)$$

where $\bar{Y}$ and $W = (T-1)S^2/\sigma^2$ are independent, and $\bar{Y} \sim$ N (μ, σ^2/T), W~ χ^2_{T-1}.

It's easy to show that

$$E(\hat{\beta}) = \beta, \qquad (13)$$

and

$$\sigma^2_{\hat{\beta}} = V(\hat{\beta}) = \frac{T-3}{(T-5)\sigma^2}\left[\frac{1}{T} + \frac{2\mu^2}{(T-3)\sigma^2}\right], \qquad (14)$$

as given in Karson *et al*.

From Equation (12) we can express the distribution of $\hat{\beta}$ as

$$f(\hat{\beta}) = \int_0^\infty f(\hat{\beta}|w)g(w)dw, \qquad (15)$$

where $f(\hat{\beta}|w)$ is the p.d.f. of normal distribution with mean $\frac{(T-3)\mu}{\sigma w} + \frac{1}{2}$, variance $\frac{(T-3)^2}{w^2 T\sigma^2}$, and $g(w)$ is the p.d.f. of χ^2_{T-1}

The distribution of $\hat{\beta}$ given in Equation (15) is a one-dimensional integral. We will next consider two approximations:

$$f(\hat{\beta}) \approx f(\hat{\beta} \mid \hat{w}) \qquad (16)$$

where $\hat{w}$ is the mode of χ^2_{T-1}, which is $T-3$. Following Ljung and Box (1980), this approximation will be reasonable if $g(w)$ is symmetric and concentrated. This will be the case when T is reasonably large. Under this approximation, $\hat{\beta}$ is normally distributed as indicated in Equation (15) and with $\hat{w} = T-3$ and $\sigma^2 = \frac{(T-1)}{(T-3)}S^2$.

A better approximation is:

$$f(\hat{\beta}) \approx \frac{1}{L}\sum_{i=1}^{L} f(\hat{\beta}|w^{(i)}), \qquad (17)$$

where $w^{(i)}$ is the i^{th} draw from χ^2_{T-1}, Gelfand and Smith (1990), Casella and George (1992).

It is noted that $\frac{1}{L}\sum_{i=1}^{L} f(\hat{\beta}|w^{(i)})$ converges to $\int_0^\infty f(\hat{\beta}|w)g(w)dw$ as $L \to \infty$, and the approximation is quite good for L large enough. The theory behind the approximation (17) is the fact that the expected value of the conditional density $f(\hat{\beta}|W)$, when W is a random variable, is

$$E[f(\hat{\beta}|W)] = \int f(\hat{\beta}|w)g(w)dw = f(\hat{\beta}). \qquad (18).$$

Thus, the formula in Equation (17) mimicks Equation (18), because $w_1^{(1)},...,w^{(L)}$ approximate a random sample from $g(w)$. Alternatively, we can think of Equation (18) as $E(X) = \mu$ where

μ can be efficiently estimated by the sample mean $\overline{X} = \frac{1}{n}\sum_{i=1}^{n} X_i$, with $X_1, ,..., X_n$ being a random sample from the distribution of X. For large *n*, $\overline{X}$ converges to μ. Similarly, for large *L*, $\frac{1}{L}\sum_{i=1}^{L} f(\hat{\beta} \mid w^{(i)})$ converges to $\int f(\hat{\beta}|w)g(w)dw$, as claimed above. This is also called the Rao-Blackwellization and is quite popular in Markov chain Monte Carlo method, a recent fashion in Bayesian statistics. For more references, see Gilks *et al*. (1996).

The distribution of $\hat{\beta}$ is useful for testing hypothesis regarding β because for any given β, the $100\alpha\%$ value can be constructed as given in Karson et al. (1995). However, Karson et al. (1995) did not deal with the issue of the confidence interval of β under asymmetric distribution of $\hat{\beta}$. This can be overcome by appealing to the asymptotic normal distribution of $\hat{\beta}$ as given below,

$\hat{\beta} \sim N(\beta, \sigma^2_{\hat{\beta}})$,

where $\sigma^2_{\hat{\beta}}$ is given in (14).

One disadvantage of the asymptotic normal distribution for $\hat{\beta}$ is the symmetric assumption of the distribution of $\hat{\beta}$, although the exact distribution of $\hat{\beta}$ is not symmetric. A remedy of this problem is to consider the posterior distribution of β using a Bayesian approach, which will lead to a natural posterior interval of β.

D. A Bayesian approach for the inference of β

In this section will consider the posterior distribution of β using a noninformative prior distribution of μ and σ^2. Our ultimate goal is to contract a posterior interval of β. Let Y_1, Y_2, ……Y_T be i.i.d. $N(\mu,\sigma^2)$ and $\underset{\sim}{Y} = (Y_1, Y_2, ..., Y_T)$. The likelihood function of μ and σ^2 is:

$$L(\mu, \sigma^2 \left| \underset{\sim}{Y}) = (2\pi)^{-T/2} (\sigma^2)^{-T/2} e^{-\frac{1}{2\sigma^2}\{(T-1)S^2 + T(\mu - \overline{Y})^2\}}. \qquad (19)$$

Using the noninformative prior

$$p(\mu,\sigma^2) \propto \frac{1}{\sigma^2},$$

and considering the transformations:

$$\beta = \frac{\mu}{\sigma^2} + \frac{1}{2}, \text{and } \sigma^2 = \sigma^2,$$

we have the following posterior density of β and σ^2:

$$\begin{aligned} P(\beta,\sigma^2|Y) &\propto (\sigma^2)^{-\frac{T}{2}} e^{-\frac{(T-1)S^2}{2\sigma^2}} e^{-\frac{T\sigma^2}{2}[\beta-\frac{1}{2}-\frac{\bar{Y}}{\sigma^2}]^2} \\ &= P(\beta|\sigma^2,\underset{\sim}{Y})P(\sigma^2|\underset{\sim}{Y}), \end{aligned} \tag{20}$$

where $\beta|\sigma^2,\underset{\sim}{Y} \sim N(\frac{\underset{\sim}{Y}}{\sigma^2}+\frac{1}{2},\frac{1}{T\sigma^2})$, and $\theta = \frac{(T-1)S^2}{\sigma^2} \sim \chi^2_{T-1}$.

Thus,

$$P(\beta|Y) = \int_0^\infty P(\beta|\theta,Y)P(\theta|Y)d\theta, \tag{21}$$

where

$$\beta|\theta,Y \sim N(\frac{\bar{Y}\theta}{(T-1)S^2}+\frac{1}{2},\frac{\theta}{T(T-1)S^2}), \tag{22}$$

and

$$\theta|Y \sim \chi^2_{T-1}. \tag{23}$$

The first two posterior moments of β can be expressed as follows:

$$E(\beta|Y) = \frac{\bar{Y}}{S^2} + \frac{1}{2}, \tag{24}$$

$$V(\beta|Y) = EVar(\beta|\sigma, \underset{\sim}{Y}) + VarE(\beta|\sigma, \underset{\sim}{Y})$$

$$= \frac{T-1}{T(T-1)S^2} + (\frac{\bar{Y}}{(T-1)S^2})^2 2(T-1)$$

$$= \frac{1}{S^2}[\frac{1}{T} + \frac{2\bar{Y}^2}{(T-1)S^2}] \ . \tag{25}$$

This can be compared with $Var(\hat{\beta})$ given in (17).

As for the distribution of β, the posterior distribution of β, as given in Equation (21), can be approximated by

$$P(\beta|\underset{\sim}{Y}) \approx \frac{1}{L}\sum_{i=1}^{L} P(\beta|\theta^{(i)}, Y), \tag{26}$$

where $\theta^{(i)}$ is the ith draw of χ^2_{T-1}.

Thus, an approximate $1-\alpha$ posterior interval (a,b) of β can be constructed from

$$\int_a^b P(\beta \mid Y)d\beta = 1-\alpha \ . \tag{27}$$

It is noted that equal tail probability can be used in selecting *a* and *b*, i.e., *a* and *b* can be selected such that both tail probabilities are $\frac{\alpha}{2}$. A better result is possible if we use the highest probability density (HPD) interval (a^*, b^*) to insure the shortest posterior interval. However, if the posterior distribution of β is nearly symmetric, as it is the case here, the construction of the HPD interval (a^*, b^*) is not highly recommended.

E. Empirical Results

To estimate the RRA parameter *β,* we use market rate of return and riskless rate data during the period of December 1926 through December 2001. The summary statistics on the log month "Excess Return" on the value-weighted indexes (1926-2001) is presented in Table 1. And, the summary statistics on the log month "Excess Return" on the equal-weighted indexes (1926 - 2001) is presented in Table 2.

In both Tables 1 and 2, column 1 presents the subperiods while the number in the parentheses of each subperiod stands for the number of months. For example, in the first row of column 2, the number 912 represents for 912 monthly observations; in the fourth row of column 2, the number 76 stands for 76 annual observations; and finally, in the tenth row of column 2, the number of 44 stands for 44 tri-monthly observations. In both Table 1 and 2, Sample Mean, Sample Standard Deviation, Sample Skewness, and Sample Kurtosis are presented in column 3, 4, 5, and 6. Finally, the column 7 presents K-S Test Statistic for testing the normality of data in terms of different observation horizons.

We have used two alternative methods – Parametric with Lognormal Distribution Method and Method of Moments, to estimate the relative risk aversion parameter β. The results are presented in Table 3 and Table 4, respectively. The data in Table 3 are estimated in terms of value-weighted indexes and in Table 4 are estimated in terms of equal-weighted indexes. In columns 1 and 2 in both Tables 3 and 4 are identical to column 1 and 2 in both Tables 1 and 2. Estimated RRA parameters in terms of Method of Moments and Parametric with Lognormal Distribution Method presented in columns 3 and 5, respectively.

F. Summary

In this project, we first briefly discussed the RRA estimation methods. Then, we use monthly market rate of return and riskless rate data to do the empirical study. The validity of the lognormal distribution for the excess market rate of return are also examined and tested before the RRA parameters are estimated. We use both the Parametric with Lognormal Distribution Method and the Method of Moments to estimate RRA parameters.

Table 1. Summary Statistics on the Log Month "Excess Return" on the Value-Weighted Indexes (1926-2001)

Value-Weighted Sub-period	No. of Observations	Sample Mean	Sample Std. Dev.	Sample Skewness	Sample Kurtosis	K-S Test p-Value
1/1926-12/2001(1)	912	0.0050	0.0550	-0.4983	6.8096	**0.0002**
1/1926-12/2001(3)	304	0.0022	0.0532	-1.5471	8.4415	**0.0047**
1/1926-12/2001(6)	152	0.0113	0.0454	-0.1009	3.9826	0.1302
1/1926-12/2001(12)	76	0.0145	0.0375	-1.1509	3.6284	0.0512
1/1926-12/2001(24)	38	0.0131	0.0427	-1.1619	3.8003	0.2691
1/1926-12/1966(1)	492	0.0061	0.0615	-0.4118	7.1200	**0.0001**
1/1967-12/1980(1)	168	0.0017	0.0479	-0.2801	0.7115	0.4240
1/1981-12/2001(1)	252	0.0052	0.0455	-1.0976	4.4722	0.1534
1/1991-12/2001(1)	132	0.0072	0.0424	-0.9536	1.9747	0.1083
1/1991-12/2001(3)	44	0.0079	0.0408	-0.3622	-0.0172	0.7291

Table 2. Summary Statistics on the Log Month "Excess Return" on the Equal-Weighted Indexes (1926-2001)

Equal-Weighted Subperiod	No. of Observations	Sample Mean	Sample Std. Dev.	Sample Skewness	Sample Kurtosis	K-S Test p-Value
1/1926-12/2001(1)	912	0.0072	0.0725	0.3385	8.5721	**0.0000**
1/1926-12/2001(3)	304	-0.0005	0.0682	-0.8294	7.2269	**0.0023**
1/1926-12/2001(6)	152	0.0056	0.0601	0.0482	3.8892	0.2176
1/1926-12/2001(12)	76	0.0061	0.0526	-1.1844	3.2306	0.2125
1/1926-12/2001(24)	38	0.0042	0.0590	-1.2534	2.9910	0.3926
1/1926-12/1966(1)	492	0.0085	0.0821	0.5936	8.4501	**0.0000**
1/1967-12/1980(1)	168	0.0071	0.0671	-0.2185	4.5158	0.8312
1/1981-12/2001(1)	252	0.0048	0.0535	-1.0498	9.0858	0.3193
1/1991-12/2001(1)	132	0.0100	0.0530	-0.5031	6.0060	0.5043
1/1991-12/2001(3)	44	0.0037	0.0423	-0.7094	1.2108	0.5747

Table 3 Estimation of Relative Risk Aversion on the Value-Weighted Indexes (1926-2001)

ue-Weighted ubperiod	No. of Observations	Method of Moments		Parameteric with Lognormal Distribution				Hausman's Specification Test	p-Va
		RRA	Std. Error	RRA_ml	Std. Error	RRA_mvu	Std. Error		
926-12/2001(1)	912	2.115	0.621	2.166	0.607	2.163	0.607	137.978	0.
926-12/2001(3)	304	1.264	1.088	1.291	1.080	1.286	1.084	12.778	0.
926-12/2001(6)	152	5.767	2.059	5.990	1.895	5.918	1.910	11.657	0.
926-12/2001(12)	76	8.872	3.726	10.839	3.489	10.563	3.554	171.964	0.
926-12/2001(24)	38	6.655	4.359	7.688	4.144	7.299	4.297	22.181	0.
926-12/1966(1)	492	2.062	0.762	2.110	0.741	2.103	0.742	35.914	0.
967-12/1980(1)	168	1.248	1.618	1.248	1.613	1.239	1.623	0.000	**1.**
981-12/2001(1)	252	2.881	1.440	3.039	1.404	3.018	1.410	61.444	0.
991-12/2001(1)	132	4.224	2.148	4.508	2.111	4.447	2.129	67.562	0.
991-12/2001(3)	44	5.173	3.855	5.221	3.830	5.001	3.936	0.528	**0.**

Table 4 Estimation of Relative Risk Aversion on the Equal-Weighted Indexes (1926-2001)

Equal-Weighted Subperiod	No. of Observations	Method of Moments		Parameteric with Lognormal Distribution				Hausman's Specification Test	p-Va
		RRA	Std. Error	RRA_ml	Std. Error	RRA_mvu	Std. Error		
926-12/2001(1)	912	1.878	0.478	1.873	0.461	1.870	0.462	1.428	**0.**
926-12/2001(3)	304	0.386	0.843	0.389	0.841	0.390	0.844	0.812	**0.**
926-12/2001(6)	152	2.045	1.386	2.041	1.362	2.020	1.371	0.037	**0.**
926-12/2001(12)	76	2.577	2.246	2.699	2.210	2.640	2.242	7.052	0.
926-12/2001(24)	38	1.671	2.810	1.695	2.764	1.630	2.848	0.085	**0.**
926-12/1966(1)	492	1.779	0.576	1.756	0.555	1.750	0.556	10.958	0.
967-12/1980(1)	168	2.062	1.175	2.076	1.163	2.057	1.170	1.174	**0.**
981-12/2001(1)	252	2.108	1.215	2.191	1.188	2.177	1.193	26.757	0.
991-12/2001(1)	132	3.880	1.779	4.065	1.700	4.011	1.715	16.438	0.
991-12/2001(3)	44	2.526	3.644	2.544	3.593	2.449	3.686	0.039	**0.**

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Part B: Alternative Hedge Ratio Estimates: Theory and Empirical Results

1. Introduction

One of the best uses of derivative securities such as futures contracts is in hedging. In the past, both academicians and practitioners have shown great interest in the issue of hedging with futures. This is evident from a large number of articles written in this area.

One of the main theoretical issues in hedging involves the determination of the optimal hedge ratio. However, the optimal hedge ratio depends on the particular objective function to be optimized. Many different objective functions are currently being used. For example, one of the most widely used hedging strategies is based on the minimization of the variance of the hedged portfolio (e.g., see Johnson, 1960; Ederington, 1979; and Myers and Thompson, 1989). This so-called minimum-variance (MV) hedge ratio is simple to understand and estimate. However, the MV hedge ratio completely ignores the expected return of the hedged portfolio. Therefore, this strategy is, in general, inconsistent with the mean-variance framework unless the individuals are infinitely risk-averse or the futures price follows a pure martingale process (i.e., expected futures price change is zero).

Other strategies that incorporate both the expected return and risk (variance) of the hedged portfolio have been recently proposed (e.g., see Howard and D'Antonio, 1984; Cecchetti, Cumby and Figlewski, 1988; and Hsin, Kuo and Lee, 1994). These strategies are consistent with the mean-variance framework. However, it can be shown that if the futures price follows a pure martingale process, the optimal mean-variance hedge ratio will be the same as the MV hedge ratio.

Another aspect of the mean-variance based strategies is that even though they are improvement over the MV strategy, for them to be consistent with the expected utility maximization principle, either the utility function needs to be quadratic or the returns should be jointly normal. If neither of these assumptions is valid, the hedge ratio may not be optimal with respect to the expected utility maximization principle. Some researchers have solved this problem by deriving the optimal hedge ratio based on maximization of the expected utility (e.g., see Cecchetti *et al.* (1988) and Lence (1995 and 1996)). However, this approach requires the use of specific utility function and specific return distribution.

Some attempts have been made to eliminate these specific assumptions regarding the utility function and return distributions. Some of them involve the minimization of mean extended-Gini (MEG) coefficient, which are consistent with the concept of stochastic dominance (e.g., see Cheung, Kwan and Yip, 1990; Kolb and Okunev, 1992 and 1993; Lien and Luo, 1993a; Shalit, 1995; and Lien and Shaffer, 1999). Shalit (1995) has shown that if the prices are normally distributed, the MEG based hedge ratio will be the same as the MV hedge ratio.

Recently, hedge ratios based on the generalized semivariance (GSV) or lower partial moments have been proposed (e.g., see De Jong, De Roon and Veld, 1997; Lien and Tse, 1998

and 2000; and Chen, Lee and Shrestha, 2001). These hedge ratios are also consistent with the concept of stochastic dominance. Furthermore, these GSV based hedge ratios have another attractive feature that they measure portfolio risk by the GSV, which is consistent with the risk perceived by managers because of its emphasis on the returns below the target return (see Crum, Laughhunn and Payne, 1981; and Lien and Tse, 2000). Lien and Tse (1998) have shown that if the futures and spot returns are jointly normally distributed and if the futures price follows a pure martingale process, the minimum-GSV hedge ratio will be equal to the MV hedge ratio.

Most of the studies mentioned above (except Lence (1995 & 1996)), ignore transaction costs as well as investments in other securities. Lence (1995 & 1996) derives the optimal hedge ratio where transaction costs and investments in other securities are incorporated in the model. Using a CARA utility function, Lence finds that under certain circumstances the optimal hedge ratio is zero, i.e., the optimal hedging strategy is not to hedge at all.

In addition to the use of different objective functions in the derivation of the optimal hedge ratio, previous studies also differ in terms of the dynamic nature of the hedge ratio. For example, some studies assume that the hedge ratio is constant over time. Consequently, these static hedge ratios are estimated using unconditional probability distributions (e.g., see Ederington, 1979; Howard and D'Antonio, 1984; Benet 1992; Kolb and Okunev, 1992 and 1993; and Ghosh, 1993). On the other hand, several studies allow the hedge ratio to change over time. In some cases, these dynamic hedge ratios are estimated using conditional distributions associated with models such as ARCH and GARCH (e.g., see Cecchetti et al., 1988; Baillie and Myers, 1991; Kroner and Sultan, 1993; and Sephton, 1993a). Alternatively, the hedge ratios can be made dynamic by considering a multi-period model where the hedge ratios are allowed to vary for different periods. This is the method used by Lien and Luo (1993b).

When it comes to estimating the hedge ratios, many different techniques are currently being employed. These techniques range from simple to complex ones. For example, some of them use such simple method as ordinary least squares (OLS) technique (e.g., see Ederington, 1979; Malliaris and Urrutia, 1991; and Benet, 1992). However, others use more complex methods such as the conditional heteroscadestic (ARCH or GARCH) method (e.g., see Cecchetti et al., 1988; Baillie and Myers, 1991; and Sephton, 1993a), the random coefficient method (e.g., see Grammatikos and Saunders, 1983), the cointegration method (e.g., see Ghosh, 1993; Lien and Luo, 1993b; and Chou, Fan and Lee, 1996), and the cointegration-heteroscadestic method (e.g., see Kroner and Sultan, 1993).

From the above discussion, it is clear that there are several different ways of deriving and estimating hedge ratios. In this report, we review these different techniques and approaches, and examine their relations.

The report is divided into four sections. In Section 2, alternative theories for deriving the optimal hedge ratios are reviewed while some empirical results of hedge ratios are discussed in Section 3. The Section 4 concludes with a summary.

2. Alternative Theories for Deriving the Optimal Hedge Ratio

The basic concept of hedging is to combine investment in the spots and futures to form a portfolio that will eliminate (or reduce) fluctuations in its value. Specifically, consider a portfolio consisting of C_s units long spot position and C_f units short futures position.[1] Let S_t and F_t denote the spot and futures prices at time *t*, respectively. Since the futures contracts are used to reduce the fluctuations in spot positions, the resulting portfolio is known as the hedged portfolio. The return on the hedged portfolio, R_h, is given by:

$$R_h = \frac{C_s S_t R_s - C_f F_t R_f}{C_s S_t} = R_s - hR_f, \qquad (1a)$$

where $h = \frac{C_f F_t}{C_s S_t}$ is the so-called hedge ratio, and $R_s = \frac{S_{t+1} - S_t}{S_t}$ and $R_f = \frac{F_{t+1} - F_t}{F_t}$ are so-called one-period returns on the spot and futures positions, respectively. Sometimes, the hedge ratio is discussed in terms of price changes (profits) instead of returns. In this case, the profit on the hedged portfolio, ΔV_H, and the hedge ratio, H, are, respectively, given by:

$$\Delta V_H = C_s \Delta S_t - C_f \Delta F_t \quad \text{and} \quad H = \frac{C_f}{C_s}, \qquad (1b)$$

where $\Delta S_t = S_{t+1} - S_t$ and $\Delta F_t = F_{t+1} - F_t$.

The main objective of hedging is to choose the optimal hedge ratio (either *h* or *H*). As mentioned above, the optimal hedge ratio will depend on a particular objective function to be optimized. Furthermore, the hedge ratio can be static or dynamic. In subsections A and B, we will discuss the static hedge ratio and then the dynamic hedge ratio.

It is important to note that in the above setup, the cash position is assumed to be fixed and we only look for the optimum futures position. Most of the hedging literature assumes that the cash position is fixed. This setup is suitable for financial futures. However, when we are dealing with commodity futures, the initial cash position becomes an important decision variable that is tied to the production decision. One such setup considered by Lence (1995, 1996) will be discussed in subsection *C*.

A. Static Case

In this section, we will discuss the following three alternative hedge ratios:

A.1. Minimum-Variance Hedge Ratio

The most widely used static hedge ratio is the minimum-variance (MV) hedge ratio. Johnson (1960) derives this hedge ratio by minimizing the portfolio risk, where the risk is given by the variance of changes in the value of the hedged portfolio as follows:

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[1] Without loss of generality, we assume that the size of the futures contract is one.

$$Var(\Delta V_H) = C_s^2 Var(\Delta S) + C_f^2 Var(\Delta F) - 2C_s C_f Cov(\Delta S, \Delta F).$$

The MV hedge ratio, in this case, is given by:

$$H_J^* = \frac{C_f}{C_s} = \frac{Cov(\Delta S, \Delta F)}{Var(\Delta F)}. \qquad (2a)$$

Alternatively, if we use definition (1a) and use $Var(R_h)$ to represent the portfolio risk, the MV hedge ratio is obtained by minimizing $Var(R_h)$ which is given by:

$$Var(R_h) = Var(R_s) + h^2 Var(R_f) - 2hCov(R_s, R_f).$$

In this case, the MV hedge ratio is given by:

$$h_J^* = \frac{Cov(R_s, R_f)}{Var(R_f)} = \rho \frac{\sigma_s}{\sigma_f}, \qquad (2b)$$

where ρ is the correlation coefficient between R_s and R_f, and σ_s and σ_f are standard deviations of R_s and R_f, respectively. The attractive features of the MV hedge ratio are that it is easy to understand and simple to compute. However, in general, the MV hedge ratio is not consistent with the mean-variance framework since it ignores the expected return on the hedged portfolio. For the MV hedge ratio to be consistent with the mean-variance framework either the investors need to be infinitely risk-averse or the expected return on the futures contract needs to be zero.

A.2. Optimum Mean-Variance Hedge Ratio

Various studies have incorporated both risk and return in the derivation of hedge ratio. For example, Hsin *et al.* (1994) derive the optimal hedge ratio that maximizes the following utility function:

$$\underset{C_f}{Max}\ V(E(R_h), \sigma; A) = E(R_h) - 0.5A\sigma_h^2, \qquad (3)$$

where A represents the risk aversion parameter. It is clear that this utility function incorporates both risk and return. Therefore, the hedge ratio based on this utility function would be consistent with the mean-variance framework. The optimal number of futures contract and the optimal hedge ratio are, respectively, given by:

$$h_2 = -\frac{C_f^* F}{C_s S} = -\left[\frac{E(R_f)}{A\sigma_f^2} - \rho \frac{\sigma_s}{\sigma_f}\right]. \qquad (4)$$

One problem associated with this type of hedge ratio is that in order to derive the optimum hedge ratio, we need to know the individual's risk aversion parameter. Furthermore, different individuals will choose different optimal hedge ratio, depending on the values of their risk aversion parameter.

Since the MV hedge ratio is easy to understand and simple to compute, it will be interesting and useful to know under what condition the above hedge ratio would be the same as the MV hedge ratio. It can be seen from equations (2b) and (4) that if $A \to \infty$ or $E\left(R_f\right) = 0$, h_2 would be equal to the MV hedge ratio h_J^*. The first condition is simply a restatement of the infinitely risk-averse individuals. However, the second condition does not impose any condition on the risk-averseness, and it is important. It implies that even if the individuals are not infinitely risk averse, the MV hedge ratio would be the same as the optimal mean-variance hedge ratio if the expected return on the futures contract is zero (i.e. futures prices follow a simple martingale process). Therefore, if futures prices follow a simple martingale process, we do not need to know the risk aversion parameter of the investor to find the optimal hedge ratio.

A.3. Sharpe Hedge Ratio

Another way of incorporating the portfolio return in the hedging strategy is to use the risk-return tradeoff (Sharpe measure) criteria. Howard and D'Antonio (1984) consider the optimal level of futures contracts by maximizing the ratio of portfolio excess return to its volatility:

$$\underset{C_f}{Max}\ \theta = \frac{E(R_h) - R_F}{\sigma_h}, \tag{5}$$

where $\sigma_h^2 = Var(R_h)$ and R_F represents the risk-free interest rate. In this case, the optimal number of futures position, C_f^*, is given by:

$$C_f^* = -C_s \frac{\left(\frac{S}{F}\right)\left(\frac{\sigma_s}{\sigma_f}\right)\left[\frac{\sigma_s}{\sigma_f}\left(\frac{E(R_f)}{E(R_s) - R_F}\right) - \rho\right]}{\left[1 - \frac{\sigma_s}{\sigma_f}\left(\frac{E(R_f)\rho}{E(R_s) - R_F}\right)\right]}. \tag{6}$$

From the optimal futures position, we can obtain the following optimal hedge ratio:

$$h_3 = -\frac{\left(\frac{\sigma_s}{\sigma_f}\right)\left[\frac{\sigma_s}{\sigma_f}\left(\frac{E(R_f)}{E(R_s) - R_F}\right) - \rho\right]}{\left[1 - \frac{\sigma_s}{\sigma_f}\left(\frac{E(R_f)\rho}{E(R_s) - R_F}\right)\right]}. \tag{7}$$

Again, if $E\left(R_f\right) = 0$, h_3 reduces to:

$$h_3 = \left(\frac{\sigma_s}{\sigma_f}\right)\rho, \tag{8}$$

which is the same as the MV hedge ratio h_J^*. As pointed out by Chen *et al.* (2001), the Sharpe ratio is a highly nonlinear function of the hedge ratio. Therefore, it is possible that equation (7), which is derived by equating the first derivative to zero, may lead to the hedge ratio that would minimize, instead of maximizing, the Sharpe ratio. This would be true if the second derivative of the Sharpe ratio with respect to the hedge ratio is positive instead of negative. Furthermore, it is possible that the optimal hedge ratio may be undefined as in the case encountered by Chen *et al.* (2001), where the Sharpe ratio monotonically increases with the hedge ratio.

3. Some Empirical Results of Hedge Ratios

In this section, we will demonstrate how three alternative hedge ratios described in equations (2b), (4), and (7). To do the empirical work, we collect daily S&P index spot, S&P index futures, foreign exchange spot of British Pound, Deutsche Mark, and Japanese Yen, and foreign exchange futures of British Pound, Deutsche Mark, and Japanese Yen. The sample periods of this data are described in column 2 of Table 1.

Hedge ratio estimate in terms of Equations (2b) and (7) are presented in Table 1. In Table 1, hedge ratios are classified into (i) daily hedge ratio, (ii) weekly hedge ratio, and (iii) monthly hedge ratio. The estimated inputs: $E(R_s)$, $E(R_f)$, σ_s, τ_f, and ρ needed to estimate hedge ratio in terms of Equation (7) are presented in Table 2.

Figure 1 presents hedge ratio estimates of S&P500 index in terms of Equation (4). Figure 2 presents hedge ratio estimates of the foreign exchange rates of US Dollar to UK Pound in terms of Equation (4). Figure 3 presents hedge ratio estimates of the foreign exchange rates of US Dollar to Deutsche Mark in terms of Equation (4). And, Figure 4 presents hedge ratio estimates of the foreign exchange rates of US Dollar to Japanese Yen in terms of Equation (4).

4. Summary

In this report of the project, we have first review the literatures related to hedge ratio theories and estimation methods. Then, we have collected necessary data of S&P500 index, exchange rates of US Dollar to UK Pound, exchange rates of US Dollar to Deutsche Mark, and exchange rates of US Dollar to Japanese Yen to estimate hedge ratios in terms of three alternative methods. These three methods are (i) minimum-variance hedge ratio method, (ii) optimum mean-variance hedge ratio method, and (iii) Sharpe hedge ratio method.

Table 1 Hedge Ratio Estimates in terms of Equations (2b) and (7)

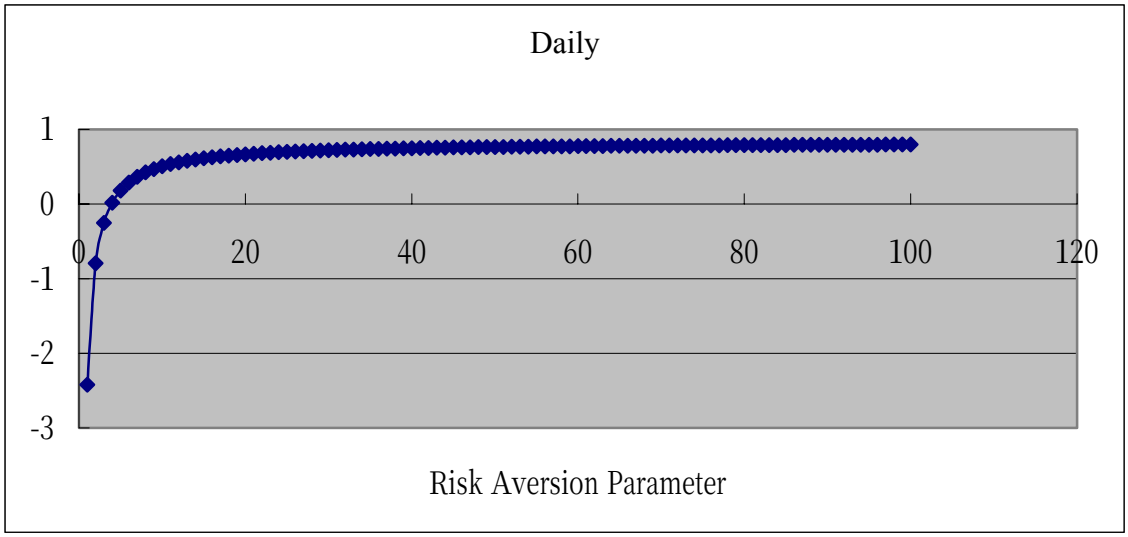
	Data Period	Eq 2b	Eq 7	α	β	Adjusted R-Square
S&P 500 Daily	1982/06/01~2003/09/04	0.8297	1.2454	6.11E-05	0.82974*	0.894153883
S&P 500 Weekly	1982/06/01~2003/09/04	0.9481	2.1226	9.61E-05	0.94812*	0.967490283
S&P 500 Monthly	1982/06/01~2003/09/04	0.9519	0.2446	0.000365	0.95186*	0.984070912
US to UK Daily	1986/01/02~2003/09/04	0.9214	0.9641	4.6E-06	0.92136*	0.824164369
US to UK Weekly	1986/01/02~2003/08/29	0.9879	1.0807	1.11E-05	0.98787*	0.934145664
US to UK Monthly	1986/01/02~2003/08/20	0.9772	1.3067	5.06E-05	0.97724*	0.964067013
US to Mark Daily	1986/01/02~2001/12/14	0.9246	0.9873	3.41E-06	0.92458*	0.821309166
US to Mark Weekly	1986/01/02~2001/12/07	0.9817	1.0738	9.53E-07	0.98174*	0.945083631
US to Mark Monthly	1986/01/02~2001/12/12	0.9881	1.1005	-9.1E-06	0.98812*	0.984952687
US to Yen Daily	1986/01/02~2003/09/04	0.9628	1.095	5.64E-06	0.96275*	0.870239776
US to Yen Weekly	1986/01/02~2003/08/29	0.9994	1.2059	1.11E-05	0.99935*	0.961071033
US to Yen Monthly	1986/01/02~2003/08/20	1.008	1.5175	1.03E-05	1.00795*	0.977609675

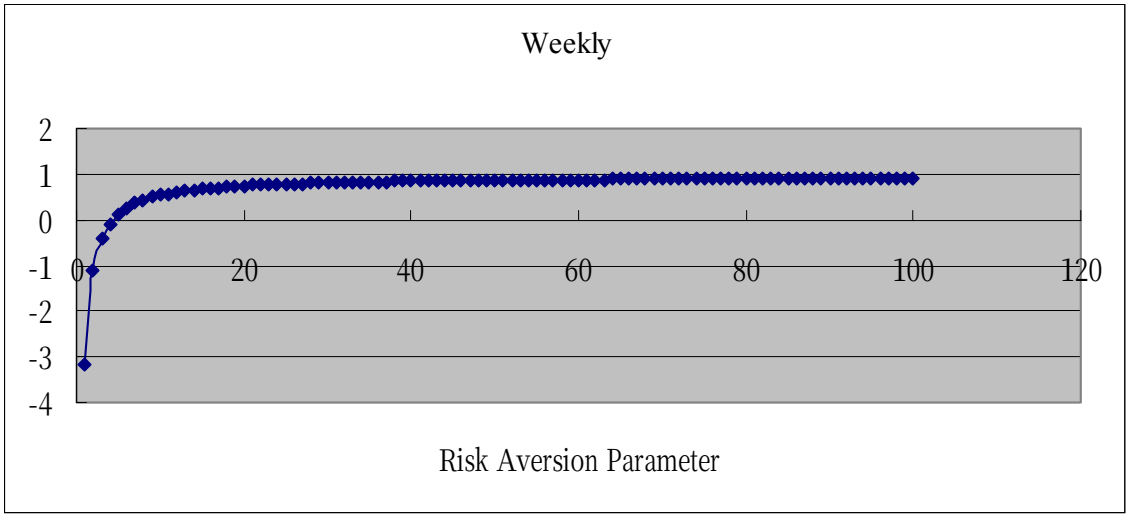
*無風險利率為 0.0155%
*代表在 5%的顯著水準下拒絕參數為 0 的虛無假設

Table 2: Inputs for Estimating Hedge Ratio in terms of Equation (7)

	現貨報酬率 平均值 $[E(R_s)]$	期貨報酬率 平均值 $[E(R_f)]$	現貨報酬率 標準差 (σ_s)	期貨報酬率 標準差 (τ_f)	報酬率 相關係數 (ρ)
S&P 500 Daily	0.000457109	0.000477325	0.010635	0.01212	0.945607
S&P 500 Weekly	0.002256921	0.00227909	0.02267	0.023519	0.983626
S&P 500 Monthly	0.010054992	0.010180161	0.049349	0.051432	0.992035
US to UK Daily	3.72134E-05	3.5395E-05	0.00632	0.006227	0.907856
US to UK Weekly	0.000202561	0.000193806	0.013931	0.01363	0.966549
US to UK Monthly	0.000996628	0.000968094	0.030738	0.030886	0.981957
US to Mark Daily	5.05892E-05	5.10328E-05	0.007038	0.006899	0.906285
US to Mark Weekly	0.000249158	0.00025282	0.015507	0.015356	0.972188
US to Mark Monthly	0.001216577	0.001240427	0.03466	0.034814	0.992488
US to Yen Daily	0.000142889	0.000142563	0.007425	0.007195	0.932882
US to Yen Weekly	0.000744107	0.000733485	0.016995	0.016672	0.980364
US to Yen Monthly	0.003211607	0.003176038	0.035419	0.034745	0.988796
無風險利率為 0.0155%					

Figure 1: Hedge Ratio Estimates of the S&P 500 Index in terms of Eq4





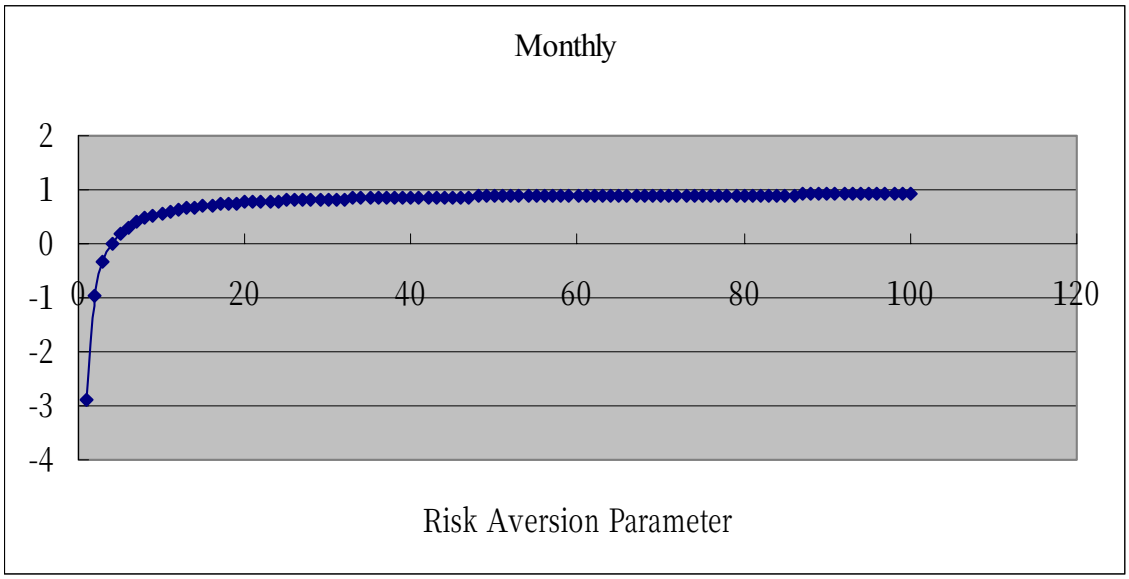
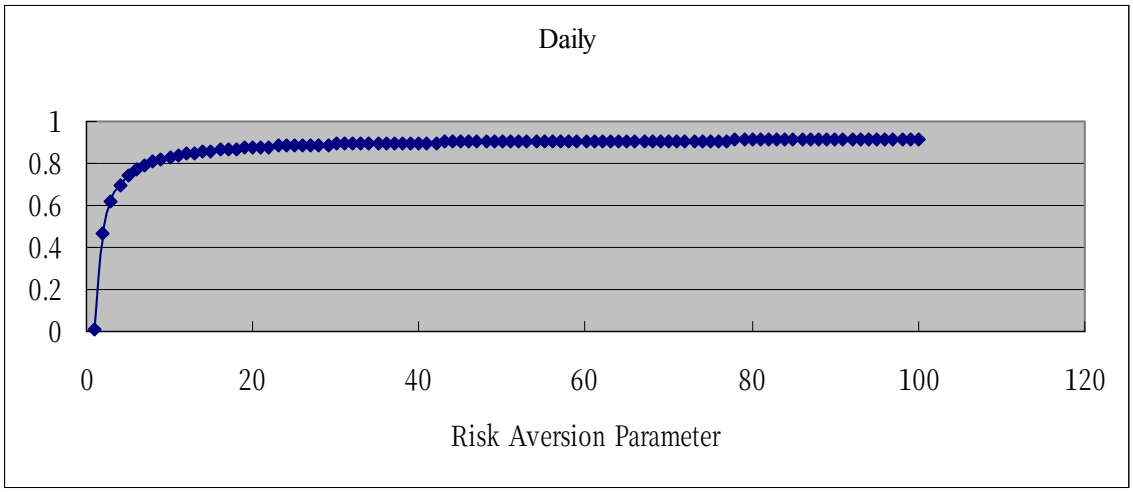
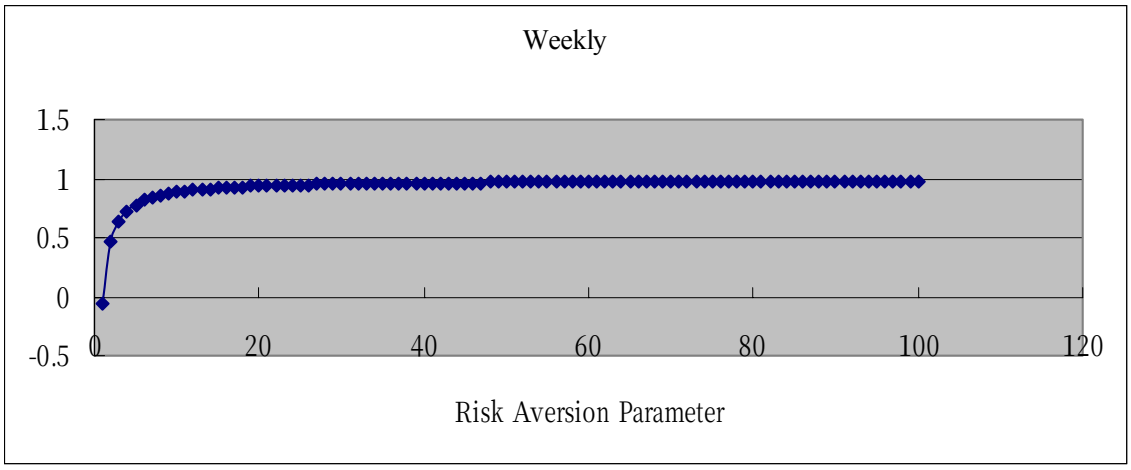


Figure 2: Hedge Ratio Estimates of the Foreign Exchange Rates of US Dollars to UK Pounds in terms of Eq4





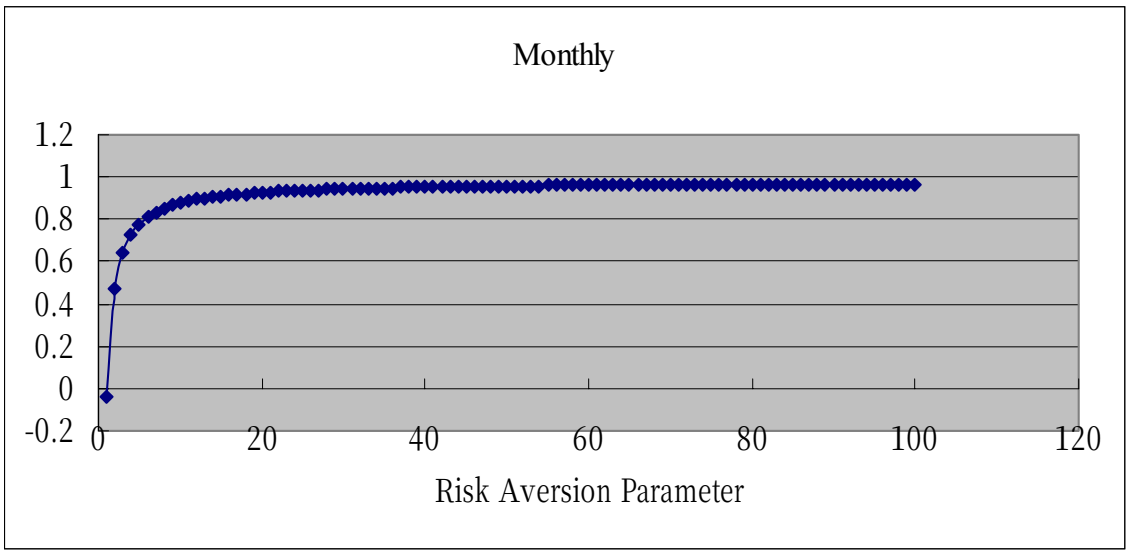
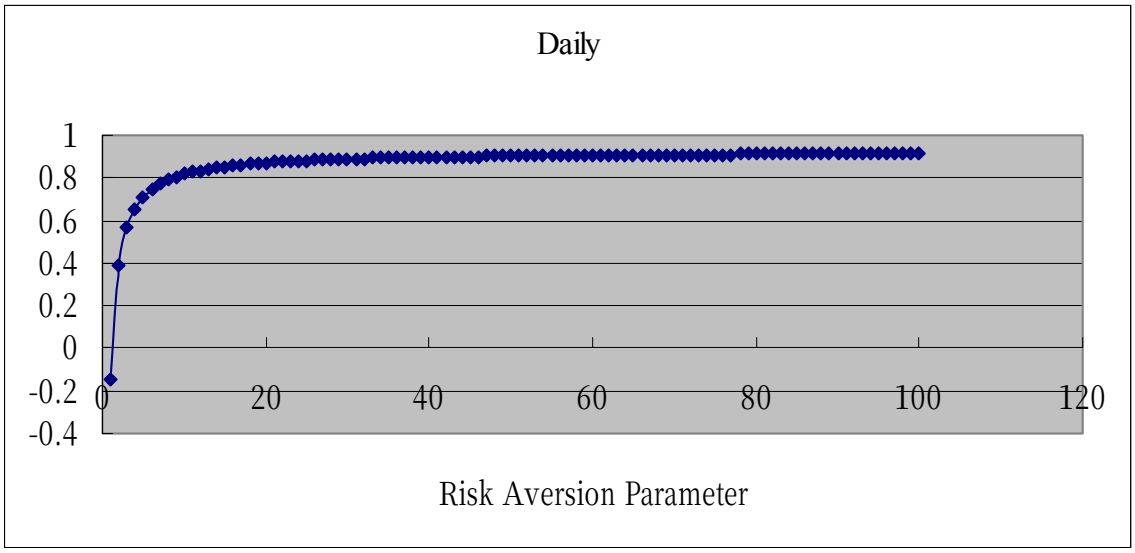
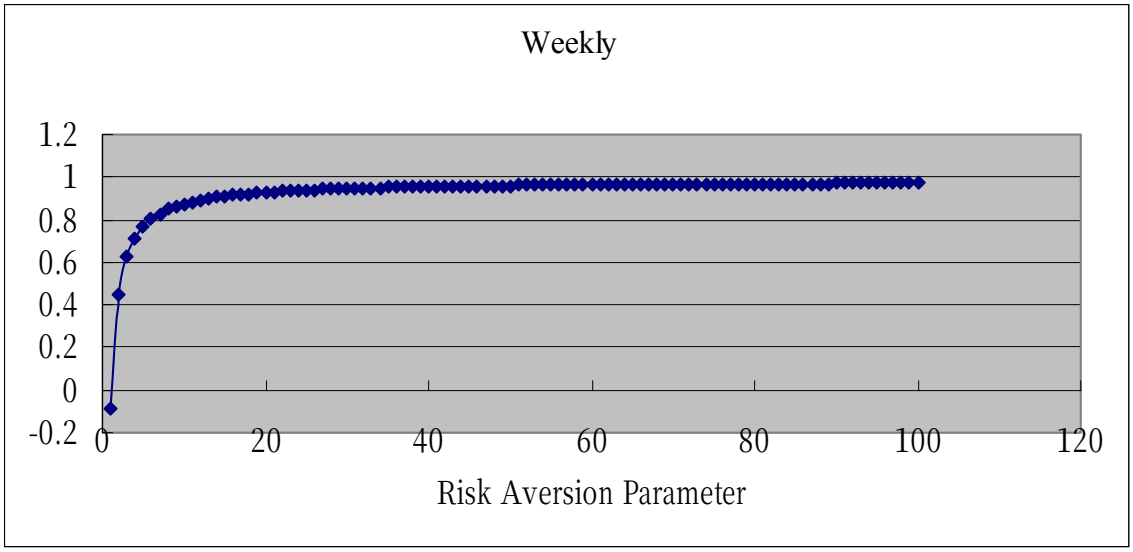


Figure 3: Hedge Ratio Estimates of the Foreign Exchange Rates of US Dollars to Deutsche Marks in terms of Eq4





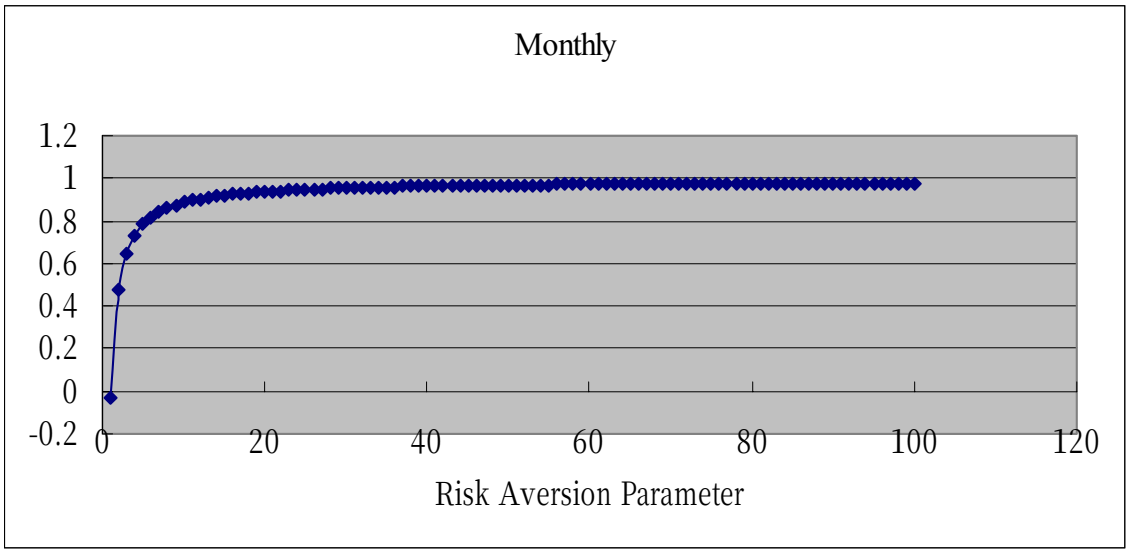
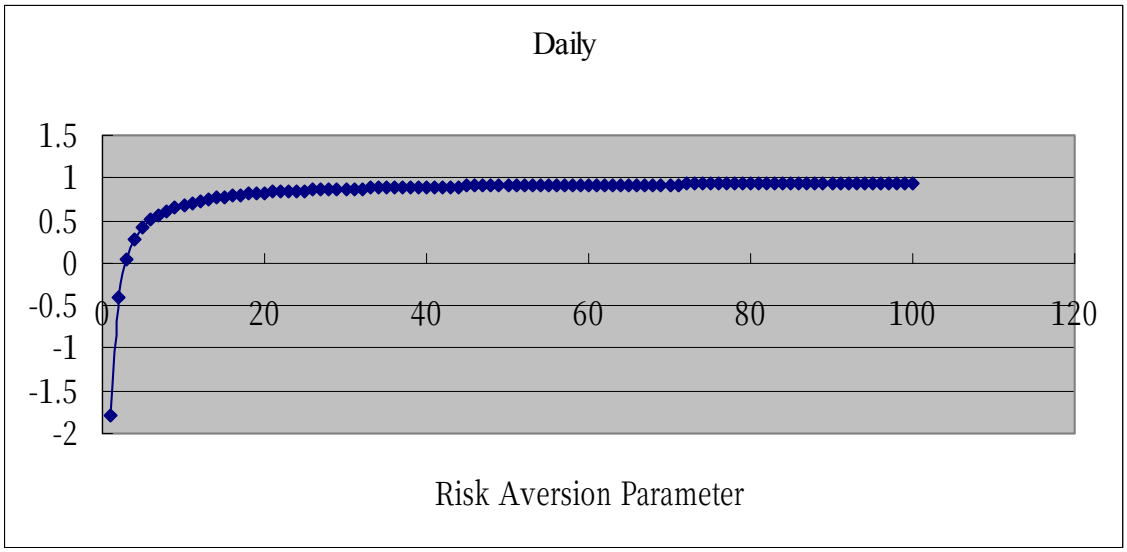
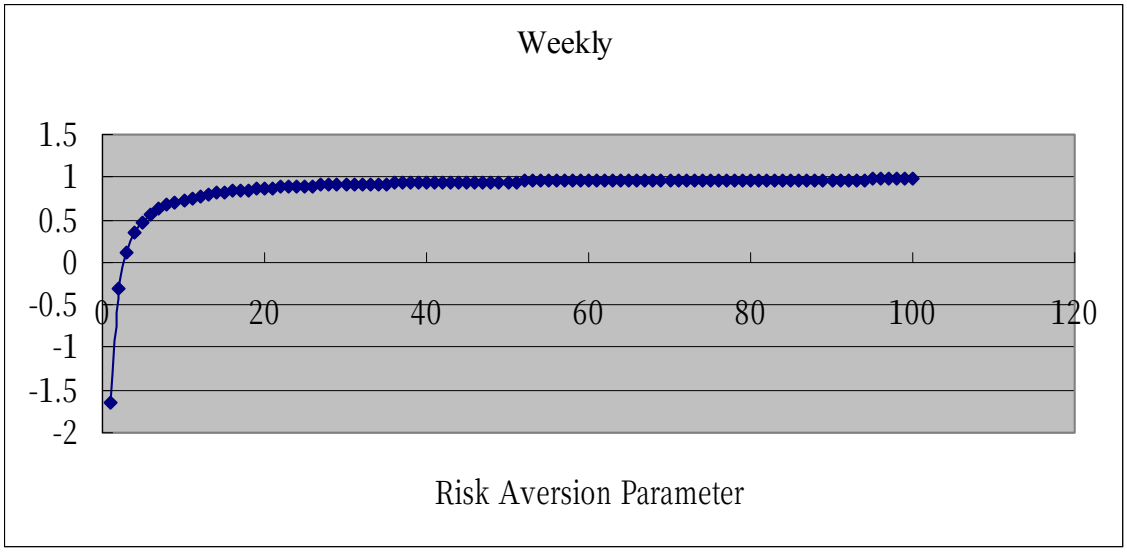
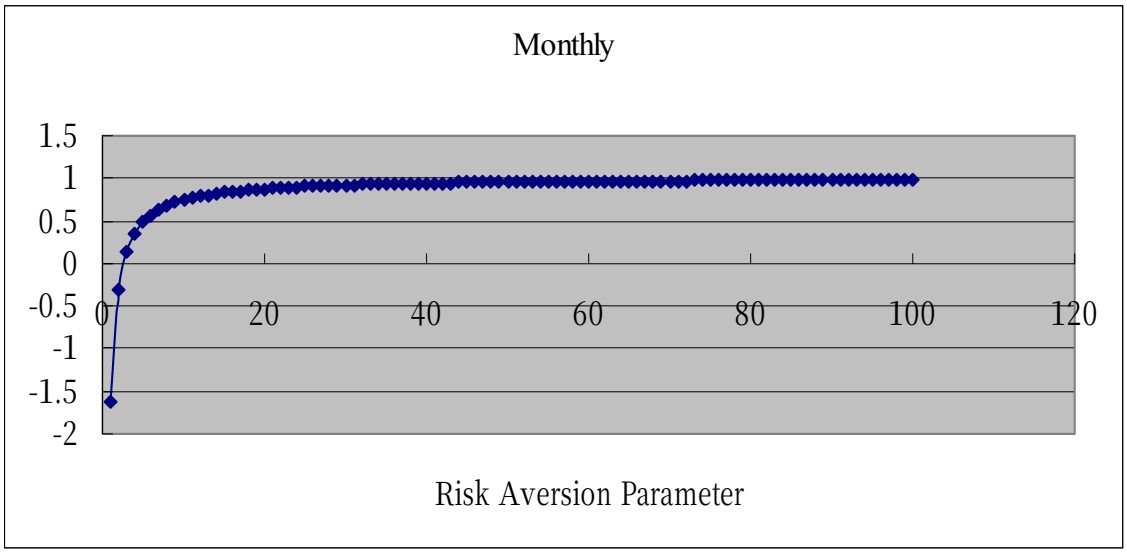


Figure 4: Hedge Ratio Estimates of the Foreign Exchange Rates of US Dollars to Japanese Yens in terms of Eq4







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III. 計畫成果自評

With the results of this research project, we'll submit two high quality papers to top academic journals in either economics or finance for publication by December 31, 2003.

出席國際學術會議心得報告

I have gone to the U. S. on November 13, 2002 to jointly in charge of the 13th Annual Conference on Financial Economics and Accounting with Professors Lemma W. Senbet, Gurdin Bakshi, Oliver Kim, and Lawrence A. Gordon. The 13th Conference on Finance Economics and Accounting was held at the University of Maryland on November 15-16, 2002. The result was both exciting and outstanding. This conference has become one of the most prestigious academic conferences in finance and accounting nationally and internationally. See the attached program for the details of the two-day event.

The fifteen-member executive committee (alphabetically) coordinated the program are as follows: Walter G. Blacconiere, Indiana University; Lawrence Brown, Georgia State University; Martin Gruber, New York University; D. Erich Hirst, University of Texas at Austin; Bikki Jaggi, Rutgers University; Frank C. Jen, SUNY at Buffalo; Jayant R. Kale, Georgia State University; E. Han Kim, University of Michigan; Oliver Kim, University of Maryland; Cheng-few Lee (conference coordinator), Rutgers University; Joe Ogden, SUNY at Buffalo; Joshua Ronen, New York University; Ehud I. Ronn, University of Texas at Austin; Lemma W. Senbet, University of Maryland; and Charles A. Trizcinka, Indiana University.

The detailed program is as follows:

November 15, 2002

12:00 Noon – 1:30 p.m. Lunch and Check-in at Inn & Conference Center

2:00 p.m. – 3:30 p.m.

Finance

- **Session I: Corporate Finance and Governance (1511 VMH)**
  Chairperson: Kose John, New York University

1. ***Corporate Governance Convergence by Contract: Evidence from Cross-Border Mergers***
   Arturo Bris, Yale University
   Christos Cabolis, Yale University

2. ***Horses and Rabbits? Optimal Dynamic Capital Structure from Shareholder and Manager Perspectives***
   Allen Poteshman, University of Illinois
   Nengjiu Ju, University of Maryland
   Robert Parrino, University of Texas-Austin
   Michael Weisbach, University of Illinois

3. ***Organizational Form and Product Market Competition: Are Focused Firms Weak Competitors?***
   Sheri Tice, Tulane University
   Naveen Khanna, Michigan State University

Discussants:

1. Toni Whited, University of Iowa
2. Robert McDonald, Northwestern University
3. Gordon Phillips, University of Maryland

Accounting

- **Session I: Pro-forma Earnings and Other Voluntary Disclosure (1505 VMH)**
  Chairperson: Joshua Ronen, New York University

1. ***Voluntary Disclosures, Information Asymmetry and Reg FD***
   Stephen Brown, Emory University
   Stephen Hillegeist, Northwestern University
   Kin Lo, University of British Columbia

2. ***Earnings Quality and Strategic Disclosure: An Empirical Examination of Pro Forma Earnings***
   Carol Marquardt, New York University
   Barbara Lougee, University of California, Irvine

3. ***Are Investors Misled by "Pro Forma" Earnings?***
   William Schwartz Jr., University of Arizona
   Bruce Johnson, University of Iowa

Session Discussant:
Bala Dharan, Rice University

3:30 p.m. – 3:45 p.m. Break (Grand Atrium, VMH)

3:30 p.m. – 5:30 p.m.

Finance

- **Session II: Asset Pricing (1511 VMH)**
  Chairperson: Craig MacKinlay, University of Pennsylvania

1. ***Testing Portfolio Efficiency with Conditioning Information***
   Wayne Ferson, Boston College
   Andrew Siegel, University of Washington

2. ***Market Myopia, Market Mania, or Market Efficiency? An Examination of Stock and Bond Price Reactions to R&D Increases and Subsequent Performance***
   Allan Eberhart, Georgetown University
   Akhtar Siddique, Georgetown University
   William Maxwell, University of Arizona

3. ***Revenue Growth and Stock Returns***
   Narasimhan Jegadeesh, University of Illinois

4. ***Testing Behavioral Finance Theories Using Trends and Sequences in Financial Performance***
   Richard Frankel, MIT
   Wesley Chan, MIT
   S.P. Kothari, MIT

Discussants:
1. Anthony Lynch, New York University
2. Guojun Wu, University of Michigan
3. Jonathan Lewellen, MIT
4. Tarun Chordia, Emory University

Accounting

- **Session II: Earnings Management (1505 VMH)**
  Chairperson: Walter Blacconiere, Indiana University

  1. ***Managers' Guidance of Analysts: International Evidence***
     Lawrence Brown, Georgia State University
     Huong Ngo Higgins, Worcester Polytechnic Institute

  2. ***The Relation Between Incentives to Avoid Debt Covenant Default and Insider Trading***
     Messod Beneish, Indiana University
     Eric Press, Temple University
     Mark Vargus, University of Texas, Dallas

  3. Using Large Changes in Asset Turnover as a Signal of Potential Earnings Management
     Ivo Jansen, Georgetown University
     Teri Yohn, Georgetown University

  Session Discussant:
     David Burgstahler, University of Washington

6:30 p.m. – 7:30 p.m. **Cocktail Reception**

7:30 p.m. – 9:00 p.m. **Dinner and Keynote Address**
(Inn & Conference Center – Main Ballroom)

Keynote Speaker: Michael J. Brennan, UCLA

November 16, 2002

8:00 a.m. – 8:30 a.m. **Continental Breakfast (Grand Atrium, Van Munching Hall)**

8:30 a.m. – 10:00 a.m.

Finance

- **Session III: Contract Design and Financial Intermediation (1511 VMH)**
  Chairperson: Anjan Thakor, University of Michigan

  1. ***The Impact of Organizational Form on Information Collection and the Value of the Firm***
     Eitan Goldman, University of North Carolina
  2. ***Optimal Contracts for Teams of Money Managers***
     Pegaret Pichler, Boston College

  3. ***Does the Source of Capital Affect Capital Structure?***
     Michael Faulkender, Washington University in St. Louis
     Mitchell Petersen, Northwestern University

  Discussants:
     1. Simi Kedia, Harvard University
     2. Amar Gande, Vanderbilt University
     3. Hamid Mehran, Federal Reserve Bank of New York

Accounting

- **Session III: The Role of Formal Models in Interpreting Empirical Evidence (1505 VMH)**

Chairperson: Thomas Hemmer, University of Chicago

1. ***Accruals, Returns, and Earnings***
   Carolyn Levine, Carnegie Mellon University
   Michael Smith, Duke University

2. ***The Effects of True and Perceived Ability***
   Qi Chen, Duke University
   Wei Jiang, Columbia University

3. On the Not so Obvious Relation between Risk and Incentives in Principal-Agent-Relations
   Thomas Hemmer, University of Chicago

Session Discussant:
Bharat Sarath, CUNY, Baruch College

10:00 a.m. – 10:15 a.m. Break (Grand Atrium, VMH)

10:15 a.m. – 11:45 a.m.

Finance

- **Session IV: Market Microstructure (1511 VMH)**
  Chairperson: Charles Trzcinka, Indiana University

1. ***Evidence on the Speed of Convergence to Market Efficiency***
   Avanidhar Subrahmanyam, UCLA
   Tarun Chordia, Emory University
   Richard Roll, UCLA

2. ***Liquidity of Emerging Markets***
   David Lesmond, Tulane University

3. ***Institutional Trading Costs on Nasdaq: Have They Been Decimated?***
   Ingrid Werver, Ohio State University

Discussants:
1. Elizabeth Odders-White, University of Wisconsin - Madison
2. Patrick Sandas, University of Pennsylvania
3. Charles Cao, Pennsylvania State University

Accounting

- **Session IV: Analyst Forecasts of Earnings (1505 VMH)**
  Chairperson: Lawrence Brown, Georgia State University

1. ***Who is Afraid of Reg FD? The Behavior and Performance of Sell-Side Analysts Following the SEC's Fair Disclosure Rules***
   Anup Agrawal, University of Alabama
   Sahiba Chadha, University of Alabama

2. ***Has Regulation Fair Disclosure Affected Financial Analysts' Ability to Forecast Earnings?***
   Partha Mohanram, New York University
   Shyam Sunder, New York University

3. Analysts' Forecasts in "Good-News" and "Bad-News" Environments: Evidence of Differential Timing of Information Arrival
   Praveen Sinha, Cornell University

Pradyot Sen, University of Cincinnati

Session Discussant:
Eric Zitzewitz, Stanford University

12:00 – 1:30 p.m. Lunch (Grand Atrium, VMH)

Distinguished Speaker: Robert E. Verrecchia, The Wharton School

1:45 p.m. – 3:15 p.m.

Finance

- **Session V: International Finance (1511 VMH)**
  Chairperson: Vojislav "Max" Maksimovic, University of Maryland

  1. ***Institutions, Markets and Growth: A Theory of Comparative Corporate Governance***
     Kose John, New York University
     Simi Kedia, Harvard University

  2. ***Patterns of Industrial Development Revisited: The Role of Finance***
     Rqymond Fisman, Columbia University
     Inessa Love, The World Bank

  3. ***The World Price of Earnigns Opacity***
     Utpal Bhattacharya, Indiana University

  Discussants:
  1. Sugato Bhattacharyya, University of Michigan
  2. Reena Aggarwal, Georgetown University
  3. Raj Aggarwal, Dartmouth College

Accounting

- **Session V: Extending the Analysis of the Earnings Returns Relation (1505 VMH)**
  Chairperson: Jeffery Abarbanell, University of North Carolina

  1. ***Earnings Quality and Price Quality***
     Ran Hoitash, Rutgers University
     Murgie Krishnan, Rutgers University
     Srinivason Sankaraguruswamy, Georgetown University

  2. ***Rational Exuberance: The Fundamentals of Pricing Firms, from Blue Chip to "Dot-Com"***
     Mark Kamstra, Atlanta Federal Reserve Bank

  3. Loss Reversals and Valuation
     Peter Joos, MIT
     George Plesko, MIT

  Session Discussant:
     Sudhakar Balachandran, Columbia University

3:15 p.m. – 3:30 p.m. Break (Grand Atrium, VMH)

3:45 p.m. – 5:45 p.m.

Finance

- **Session VI: Derivatives and Risk Management (1511 VMH)**
  Chairperson: Ehud Ronn, University of Texas - Austin

1. ***Overconfidence and Speculative Bubbles***
   Wei Xiong, Princeton University
   Jose Scheinkman, Princeton University

2. ***Idiosyncratic Risk and Creative Destruction in Japan***
   Yasushi Hamao, University of Southern California
   Jianping Mei, New York University
   Yexiao Xu, University of Texas - Dallas

3. ***Fed Funds Rate Targeting, Monetary Regimes and the Term Structure of Interbank Rates: Explaining the Predictability Smile***
   Vassil Donstantinov, University of Wyoming

4. ***Modeling Credit Risk and Partial Information***
   Yildiray Yildirim, Syracuse University
   Unut Cetin, Cornell University
   Robert Jarrow, Cornell University
   Philip Protter, Cornell University

Discussants:
1. Michael Gallmayer, Carnegie Mellon University
2. Burton Hollifield, Carnegie Mellon University
3. David Chapman, University of Texas - Austin
4. Greg Duffee, University of California - Berkeley

Accounting

- **Session VI: International Accounting (1505 VMH)**
  Chairperson: Larry Gordon, University of Maryland

1. ***(Non) Convergence in International Accrual Accounting: The Role of Institutional Factors and Real Operating Effects***
   Peter Joos, MIT
   Peter Wysocki, MIT

2. ***Economic Consequences from Mandatory Adoption of IASB Standards in the European Union***
   Joseph Comprix, Arizona State University
   Karl Muller, Pennsylvania State University
   Mary Stanford-Harris, Texas Christian University

3. Stock Exchange Disclosure and Market Liquidity: An Analysis of 50 International Exchanges
   Carol Frost, Dartmouth College
   Elizabeth Gordon, Rutgers University
   Andrew Hayes, Ohio State University

Session Discussant:
   Christian Leuz, University of Pennsylvania

6:30 – 8:00 p.m. Optional Dinner (Inn & Conference Center - Chasen Family Room)