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Contents

Measuring and Visualizing the Asymmetries in Stock Market Volatility: Case of Hong Kong

Anson Wong*
School of Accounting and Finance,
The Hong Kong Polytechnic University,
Hong Kong
Email: afanson@inet.polyu.edu.hk

Kui Yin Cheung
Department of Economics,
Lingnan University,
Hong Kong
E-mail: kycheung@ln.edu.hk

Abstract

This study makes use of a family of GARCH models to study the evolution of stock price volatility in the Hong Kong stock market from 1984 to 2009. A number of variables that may lead to the volatility of the Hong Kong stock market were examined: these variables include the fluctuation of the Shanghai A-Share Price Index, the change of crude oil price and the interest rate movement. The News Impact curve is built to compare the impact of news on the volatility of the stock return and provide us with a good visible solution to the results of an asymmetric effect on the Hang Seng daily return as well. Empirical results show that both the EGARCH and AGARCH models can detect the asymmetric effect well in response to both good news and bad news. By comparing different GARCH models, we find that it is the EGARCH model that best fits the Hong Kong case.

Keywords: GARCH Model, Volatility, Asymmetric Effect, Stock Market, Hong Kong
*Corresponding author

I. INTRODUCTION

Following the introduction of the autoregressive conditional heteroscedasticity (ARCH) model by Engle (1982), many researchers (Bollerslev (1986), Rabemananjara & Zakoian (1993), Engle et al. (1995), Engle (2001), Hatemi-J (2003), Hatemi-J & Abdulnasser (2004), and Hacker & Hatemi-J (2005) have successfully applied the ARCH / GARCH models, using financial and macroeconomics data, to explain the phenomenon of economy and financial market. At the same time, a number of studies using generalised ARCH (GARCH) models have been used to study the Hong Kong stock market as well; the results, however, are somewhat mixed. These include Lee (1991), McMillian et al. (2000), Dun and Zhang (2001), Poon and Granger (2003), Engle (2004), Yeung and Cannon (2004), Wong and Fung (2002), and Li (2007) on capturing the structure changes in the Hong Kong stock market; and Fong and Koh (2002), So et al. (2002), and Li (2007) on capturing the asymmetric effects[1] in the stock markets.

A family of GARCH models is used to examine the evolution of stock price volatility in the Hong Kong stock market and the News Impact curve is built to visualize the asymmetry effect on the Hang Seng Index (HSI) return from 1984 to 2009. The aim of the paper is to add to the literature on volatility analysis and the asymmetry effect on the stock market of Hong Kong which is dominated by property developers and financial institutions. In line with previous empirical studies, we also examine whether there are other variables that may lead to the volatility of the stock market. These variables include the fluctuation of the Shanghai A-Share Price Index, the change of crude oil price and the interest rate movement.

Our empirical results show strong evidence of shifting stock market volatility under different regimes: that is high-volatility associated with bad news (negative shocks) and low-volatility associated with good news. In addition, we find the existence of an asymmetric effect in the Hong Kong stock market with both the exponential GARCH (EGARCH) and Asymmetric GARCH (AGARCH) models. By comparing these models, we can conclude that the EGARCH model is the best model to explain the volatility and the asymmetric effect of the Hong Kong stock market.

The paper is organised as follows. The next section reviews the literature on the ARCH and GARCH models. The following sections describe the methodology and discuss the measures that have taken place to obtain the asymmetric effect. This is followed by the data and the empirical results. We conclude with the implications in the final section.

[1] Asymmetric effects refer to the high-volatility of stock return associated with bad news (negative shocks) and low-volatility associated with good news.

II. LITERATURE REVIEW

Based upon the capital asset pricing model, risk is the most important element to the return on an asset. Variance of the returns, a measurement of risk in modern financial theory, is important for forecasting the movements of financial time series. In real life, many financial time series show a non-constant mean and variance during different periods.[2] However, this phenomenon cannot be satisfied with the classical assumption on stationary process, since the ARMA model assumes that the sample variance is constant over time. Thus, it is necessary to establish a model which can capture the characteristic of a time-varying variance of stock returns.

The ARCH model proposed by Engle (1982) allows the conditional variance to change over time. Since then many researchers (Bollerslev (1986), Engle et al. (1995), Rabemananjara & Zakoian (1993), Engle (2001), Hatemi-J. (2003), Hatemi-J. & Abdulnasser (2004), and Hacker & Hatemi-J (2005)) have successfully applied the ARCH/GARCH models, using financial and macroeconomics data, to explain the phenomenon of economy and financial market. Engle (1982) examines inflation in the United Kingdom and whether the variance of inflation was higher in some periods than in others. French et al. (1987), using the S&P 500 Index from 1928 to 1984, examines the relationship between stock return and stock market volatility. The GARCH (2,1)-M is used and it has illustrated that there exists a positive relationship between the expected market-risk premium and the predictable volatility of stock returns. It implies that risk premiums are highly persistent and the volatility of stocks would have a large effect on prices. Since the ARCH model focuses mainly on the first and second moment and some of the financial

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[2] Mandelbrot (1963) states that the sample variance takes different values at different times in practice and large variances seemed to cluster together but small variances concentrated at other period

models have more than one asset[3], Harris and Sollis (2003) and Engle and Kroner (1995) proposed a new parameterisation of the multivariate ARCH process for modelling the second and higher moment.

Asymmetric effects have been found in many financial series like equity and interest rates. Earlier works (Black (1976), Christie (1982), French et al. (1987), Nelson (1990), Schwert (1990)) have documented that a negative shock to a financial time-series is likely to cause higher volatility than a positive shock of the same magnitude.[4] Nelson (1991) proposes the exponential GARCH (EGARCH) model to capture the asymmetry effect in asset returns. Glosten et al. (1993) make use of the EGARCH model and the Glosten-Jagannathan-Runkle GARCH (GJR) model to catch the responses caused by different news[5]. Engle & Ng (1993) investigate the asymmetric effect of the Japanese stock market with various GARCH models including the AGARCH, the EGARCH, the non-linear GARCH (NGARCH), and the GJR. Asymmetric effects have been confirmed to exist in the Japanese stock market. Among these models, the GJR model is found to be the best model to explain the asymmetric effect in the Japanese stock market. Moreover, a news impact curve is incorporated into the volatility estimates. Braun et al. (1995), using bivariate EGARCH, estimates the asymmetries in the US monthly stock return for the period July 1926 to December 1990. They find strong evidence of conditional heteroscedasticity in both the market and non-market components of returns, while an asymmetric effect exists in the market component of volatility, but not in the non-market source

[3] Estimating a single equation ARCH or GARCH would be ignoring the possibility that there may be causality between the conditional variances in both directions and would not be truly exploiting the covariance between the series.

[4] This phenomenon is called the 'asymmetric effect', also known as the 'leverage effect'. A model, neglecting the asymmetric effect, would underestimate volatility after bad news and overestimate volatility after good news. This would result in lowering the accuracy of volatility prediction in asset pricing and portfolio selection.

[5] News includes good news and bad news

of risk. There are various further extensions on ARCH/GARCH models which have contributed to econometric analysis; however, they are not presented in this study.

III. METHODOLOGY

A set of GARCH models is methods will be employed to examine the volatility and asymmetric effect of stock returns in Hong Kong's stock market. This includes the ARCH and the GARCH models, the Asymmetric GARCH Model, and the Exponential GARCH model.

To determine whether or not the series are stationary[6] , the Augmented Dickey – Fuller (ADF) test will be used to test if a unit root exists. The Akaike Information Criterion (AIC) will then be used to determine the number of lag used in the estimation. Both the ARCH and GARCH model will be used for the estimation of volatility and forecasting in this analysis. In addition, the EGARCH[7] and the AGARCH[8] models will also be used to capture the asymmetry effect under conditional variance.

In the ARCH-M model,[9] the ARCH effect appears in the mean of the process. Since there is a close relationship between risk and return, high risk would be compensated by higher return.

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[6] Diebold and Kilian (1999) mentioned that an examination of the series is important for accurate forecasting because it can tell us about what kind of processes need to be built into the model.

[7] Nelson (1993) proposed the EGARCH model to capture the asymmetry effect. The formula of the EGARCH model is in terms of the log of conditional variance:

$$\log \sigma_t^2 = \alpha_0 + \sum_{i=1}^{\infty} \psi_i g(\varepsilon_{t-i}), \qquad \psi_0 = 1 .$$

$$g(\varepsilon_t) = \omega\varepsilon_t + \lambda\left[|\varepsilon_t| - E|\varepsilon_t|\right]$$

[8] Asymmetric GARCH proposed by Engle in 1990. The basic equation for conditional variance under the AGARCH model is:

$$h_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i (\varepsilon_{t-1} + \gamma)^2 + \sum_{i=1}^{p} \beta_i h_{t-1}$$

γ is a parameter which is used for measuring the asymmetric effect.

[9] The ARCH in the mean model (ARCH-M) was first proposed by Engle, Lilien and Robbins (1987). In the ARCH-M model, the ARCH effect appears in the mean of the process.

The conditional means, therefore, should include the conditional variance. Thus, the ARCH-M model will be used and is represented as:

$$y_t = \mu + \delta\sigma_{t-1} + \mu_t, \qquad \mu_t \sim N(0, \sigma_t^2)$$
$$\sigma_t^2 = \alpha_0 + \alpha_1\mu_{t-1}^2 + \beta\sigma_{t-1}^2 \,.$$

We first use the OLS to estimate the model of Y_t and obtain the fitted residuals μ_t. Then we regress μ_t^2 on μ_{t-i}^2's and test the hypothesis, $H_0: \ \alpha_1 = \alpha_2 = ... = \alpha_j = 0,$ against the alterative hypothesis, H_1 : at least one of the coefficients is not equal to zero. If there is an ARCH effect in the model, one of the estimated parameters of α_i should be statistically and significantly different from zero. Thus, we can reject the null hypothesis and conclude that μ_t^2 is not constant over time.

To test for an asymmetric effect, a joint test proposed by Engle (1993) will be used in this study. This test generally is a combination of the sign bias test (SBT), the negative size bias test (NSBT), and the positive bias test (PSBT). A graphical presentation of the asymmetric effect--called the "News Impact curve", as introduced by Engle and Ng (1993), will be used. The curves generally graph by using a condition variance equation. The values of lagged residuals are used in the equation to determine the value of current variance. If an asymmetric effect exists in the series, the slope of the two sides of the news impact curves should not be symmetric.

The equations for the EGARCH (1, 1) news impact curve are:

$$h_t = A \cdot \exp\left[\frac{(\gamma+\alpha)}{\sigma} \cdot \varepsilon_{t-1}\right], \text{ for } \varepsilon_{t-1} > 0, \text{ and}$$
$$h_t = A \cdot \exp\left[\frac{(\gamma-\alpha)}{\sigma} \cdot \varepsilon_{t-1}\right], \text{ for } \varepsilon_{t-1} < 0. \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3.5)$$

The equation of the Asymmetric GARCH model news impact curve is:

$$h_t = \omega + \alpha(\varepsilon_{t-1} + \gamma)^2 + \beta h_{t-1} \,. \qquad \ldots\ldots\ldots\ldots\ldots.. \quad (3.6)$$

If an asymmetric effect exists in the series, the slope of the two sides of the news impact curves will not be symmetric.

IV. DATA

The data used in this paper are the daily closing prices of the Hong Kong Hang Seng Index (HSI) for the period 1 September 1984 to 30 September 2009. The HSI is a value-weighted price index and is widely used as a barometer of the entire Hong Kong stock market. All the data were obtained from DataStream. The general pattern of the Hong Kong HSI is shown in Figure 1.

(Inserted Figure 1 here)

From Figure 1, it is obvious that there was an upward trend from 1984 to 2009, with a highly fluctuated period from 1994 to 2003 and a big drop in late 2008 due to the global financial turmoil. It visualize the asymmetry effect on the Hang Seng Index (HSI) return that is a high-volatility of stock return associated with bad news (negative shocks) and low-volatility associated with good news.

Other than the HSI, we added the Shanghai A-Share Price Index, the Crude Oil Price (month FOB), the US Federal Funds Rate (middle rate), and the Hong Kong Prime Rate (middle rate) into our analysis. These data are sourced from DataStream as well. The correlation matrix of these variables and the logarithm difference of these variables are shown in Table 1.

(Inserted Table 1 here)

V. EMPIRICAL RESULTS

Figure 2 plots the time series of the daily return of the Hong Kong Hang Seng Index (HSI). The daily return in this analysis is defined as $R_t = \ln P_t - \ln P_{t-1}$. From the figure, we observe that the mean return is relatively constant but there is clear evidence of time-varying volatility. These volatility periods include the October 1987 global stock market crash, the 1997 Asian currency crisis and the Russian debt default of August 1998 and the recent 2008 global financial crisis. In line with the U.S. evidence (e.g., Engle and Mustafa, 1992), the effect of the crash on the volatility of the Hong Kong stock market seems to be short lived. Figure 2 also reveals that, apart from the 1980s, there were few prolonged periods of high volatility over the last two decades.

(Inserted Figure 2 here)

Table 2 shows the result of the AIC value under an ADF test for lag 1 to lags 10. We observe that lag 2 is found to have the smallest AIC value among all. Since the 5 percent and the 1 percent critical values for 6511 observations are 2.86 and -3.43, respectively, and the calculated t-value (ADF) is -44.69, we can conclude that the unit root testing on residual is statistically significant. Therefore, lag 2 of the HSI will be used in our analysis.

(Inserted Table 2 here)

To determine if some other variables might have an impact on the stock price index[10], we will include these variables into the autoregressive model. The estimated results using the ARCH model are shown in Table 3a. From Table 3a, we observe that the coefficients of the Shanghai A-Share Price Index (DLSHA), and the Crude Oil price (DLOILP**)** are positive and statistically significant at the 1 percent level. This is in line with the previous studies which find a positive relationship between the change in market index and that in the commodity price (e.g., Fan (2003), Bala and Pemaratne (2003), and Fama and French (1988)). However, we find that the

[10] Mandelbort (1963) states that price changes are not independent and a pattern might exist in the successive price movement. On the other hand William (1979), and many technical analysts, state that it is possible to use the changes in commodity price, open interest and other significant stock market indices to predict the movement of the index.

coefficients of the Hong Kong Interbank rate (3-Month) (DHKIBK) and the Hong Kong Prime rate (DPRIME) are negative and highly significant at the 1 percent significance level as well.

(Inserted Table 3 here)

One of the possible explanations for the negative effect of the Hong Kong Interbank rate (DHKIBK) and Hong Kong Prime rate (DPRIME) on the daily return of the Hang Seng Index is due to the short term speculations in the market. In the Hong Kong stock market, a T+2 method (the settlement day is two days after the trading date) is used. When the Interbank rate increases, the lending rate**,** including the prime rate, will rise; the cost of speculation will increase and the financially weak speculators will be forced to sell their stocks. This will cause the Hang Seng Index to fall, and in turn, the return on the Hang Seng Index will decline. Thus, a higher interbank rate would have a negative effect on stock returns.

The Shanghai A-Share stock price index (DLSHA) has a positive effect on the daily return of the Hang Seng Index. As a number of Chinese state-owned large scale shares, especially financial and property shares, are listed both in the Hong Kong stock market and Shanghai stock market, it is reasonable to expect that the two markets have the same market movement on the same day.

The Lagrange Multiplier test for ARCH indicates that conditional heteroscedasticity exists in the series (see Table 3b). The estimated coefficients of the squared residuals of the first and second lags are statistically significant. The F-statistic of 400.83 indicates that we can reject the null hypothesis that all the coefficients of the squared residuals are equal to zero. The ARCH effect is then confirmed in the series. In order to allow the property of time varying variance, the ARCH model will be applied in this series.

Figure 3 shows the estimated conditional variance of the Hang Seng Index. We observe that the conditional heteroscedasticity exists in this series[11]. It is shown clearly in the figure that the clustering of volatility is present in the series; and the highest volatility is observed during the recent period of the global financial crisis.

(Inserted Figure 3 here)

We use the same explanatory variables to estimate the GARCH model as we did in the previous section. The result is shown in Table 4(a). The estimated coefficients of DLHSI1, DLSHA, DLSHA1, DHKIBK, and DPRIME1 are highly significant in the conditional mean equation. It implies that the volatility of the Hang Seng Index is time-varying. It is not constant over time. From Table 4(b), we observe that the sum of α and β is 0.995, which is smaller than one, indicating that the model is stationary. This implies the persistence of the conditional variance is very high. There is a shock of 9% $(0.995)^{30}$ in the Hang Seng Index within 30 days.

(Inserted Table 4a and b here)

The estimated result of the GARCH-M (1,1) model is shown in Table 5(a) and its conditional variance equation is included in Table 5(b). In Table 5(a), we observe that the estimated coefficients of various variables are close to those in the GARCH model. The estimated coefficient of *ht*, the conditional variance of $\varepsilon_{t,}$, is 0.92 but statistically insignificant. Since the expected Hang Seng stock return is a linear function of the conditional standard deviation (Engle et al. (1987)) over the study period, the Hang Seng index is volatile and the risk-averse agents will switch to less risky assets thus driving the risk premium upward. Therefore, a positive relationship between *ht* and the Hang Seng Index stock return is estimated. This shows that there exists a positive relationship between return and conditional variance, but it is not statistically significant. Hence, the result cannot support the traditional assumption in finance that a high-

[11] Mandelbrot (1963) states that conditional heteroscedasticity exists in a series when the high volatility concentrate at a period while the low volatility concentrate at another period.

risk investment is associated with a high return when we trade the Hang Seng Index. Again, from Table 5(b), we observed that the sum of α and β is 0.995, which is smaller than one, indicating that the model is stationary. This implies the persistence of the conditional variance as well.

(Inserted Table 5a and 5b here)

B. ASYMMETRIC EFFECT ON THE HSI

To test the existence of asymmetry effects in the Hong Kong Hang Seng Index, the Exponential GARCH (EGARCH) model and the asymmetric GARCH (AGRCH) model will be used. The estimation results of the EGARCH and AGARCH models are shown in Table 6 and 7, and Table 8 and 9, respectively.

Table 6 shows the results of the EGARCH model. The coefficients of DLSHA1, DHKIBK and DPRIME_1 are statistically significant at the 1 percent level. As the coefficient of θ_1 is negative and its t statistic is 10.4 which is statistically significant at the 1 percent level, it indicates that the asymmetric effect is present[12].

In line with the result of Table 6, Table 7 indicates that the coefficient of θ_1 is negative and it is statistically significant at the 1 percent level, and the coefficients of DLSHA1, DHKIBK and DPRIME_1 are also statistically significant at the 1 percent level. This indicates that there is a negative relationship between the expected Hang Seng Index return and the conditional variance, h_t. The expected return is not a linear function of the conditional standard deviation. All these results imply that the asymmetric effect is present.

(Inserted Table 6 and 7 here)

The estimated results of the AGARCH model are presented in Table 8 and Table 9. Both tables show similar results and the coefficients of Gamma are also statistically significant at the 1

[12] For details, please refer to Harris and Sollis (2003), page 234.

percent level; therefore, this confirms the existence of an asymmetric effect in the Hang Seng Index. This means that an unexpected negative shock tends to increase volatility more than an unexpected positive shock of the same magnitude.

(Inserted Table 8 and 9 here)

Figure 4 and 5 present a visible method for checking whether the asymmetric effect exists in the series in question. From Figure 4, we observe that the news impact curve of the GARCH and EGARCH model are symmetric around the zero lagged residual (see Figure 4), while the centre of the news impact curve of the AGARCH model is located at the positive lagged residual (see Figure 5). Obviously, both of the news impact curves of the EGARCH and AGARCH models have a greater response than the GARCH model when the lagged residual is negative. It indicates that the return of the Hong Kong Hang Seng Index tends to be more volatile in response to bad news than that of good news. As a negative shock to financial time-series is likely to cause higher volatility than a positive shock of the same magnitude, we can conclude that there exists an asymmetry effect in the Hang Seng Index return.

(Inserted Figures 4 and 5 here)

The finding of strong asymmetric effects in the Hong Kong stock market is attributed to a number of factors. First of all, the Hong Kong market is very sensitive to the change in China's stock market, especially the Shanghai A-Share market, as the correlation between the Hang Seng's returns and Shanghai's A share returns is high (0.77). In addition, the Hang Seng Index covers a large proportion of Chinese state-owned large shares which are also being listed on the Shanghai stock market. Thus, the volatility of the Shanghai stock market would further fluctuate the Hang Seng Index, and hence it enhances the asymmetric effect of the Hong Kong Hang Seng Index.

Secondly, the Hong Kong stock market is a small but open market; so it is sensitive to fluctuations in the global markets. A change in the commodity price, such as oil, and a movement of the interest rate in the United States will also have an effect on the Hong Kong stock market. Besides, Ho (1998) indicated that the Hang Seng Index performance is highly responsive to the volatility of the financial and property sectors, as the Hang Seng Index is dominated by highly leveraged firms from the banking and real estate sectors. Thus, it will easily suffer from increasing asymmetric effects (because financial leverage brings the financial risk of running into debt).[13]

C. MODELS COMPARISON

From the above, we find evidence of regime shifts in the conditional volatility of daily returns on the Hang Seng Index. The improvement in fit is largely due to the ability of the EGARCH model to account for volatility asymmetry. The AGARCH model and EGARCH model finds that the leverage effect is significant only in the Hang Seng Index. We used the AIC for model comparison as it is the fundamental rule for the evaluation of the goodness of models. In Table 10, we find that the EGARCH model achieves the smallest value of AIC among the GARCH models. Hence, we can conclude that the EGARCH model is the best model, as the result shows that the EGARCH model can capture the information underlying the data better than other GARCH models.

(Inserted Table 10 here)

VI. CONCLUSION

In this paper, we apply a family of GARCH models to study the evolution of stock price volatility in the Hong Kong stock market. In line with previous empirical studies, we find strong

[13] Analysis of financial 'leverage effect' corresponds to a negative correlation between past returns and future volatility as volatility increases when the stock prices fall. The relationship between stock returns and volatility changes connect to the degree of financial leverage in its capital structure (Figlewski and Wang, 2002).

evidence of regime shifts in volatility. We also find the existence of an asymmetric effect in the Hong Kong stock market. The news impact curve provides us a good visible solution of the results of an asymmetric effect on the Hang Seng daily return. We find that both the EGARCH and AGARCH models detect the asymmetric effect well in response to good news as well as bad news, and the impact of bad news would result in relatively high volatility than that of good news. Finally, by comparing different GARCH models, we find that it is the EGARCH model that fits best to the Hong Kong case.

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Figure 1: The Hong Kong Hang Seng Index from August 31 1984 to Sept 1 2009

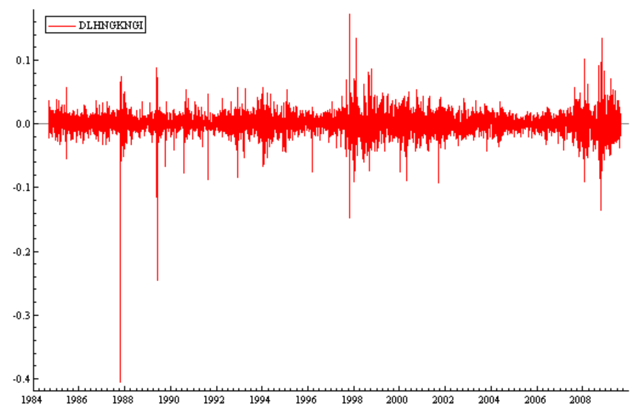


Figure 2: The Daily Return of Hong Kong Hang Seng Index

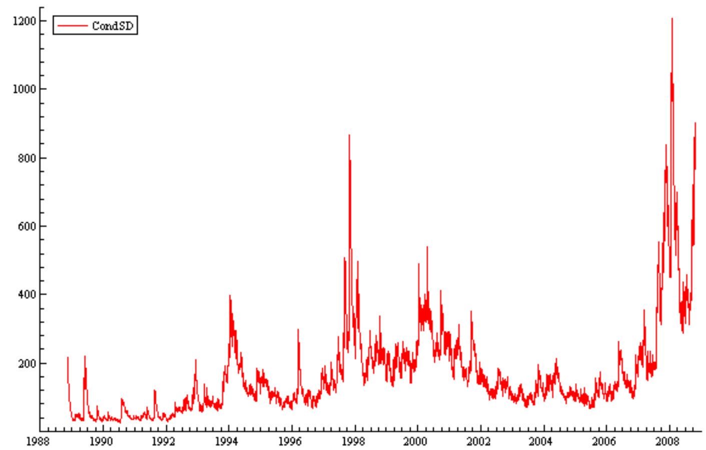


Figure 3: Estimated conditional variance of Hang Seng Index from GARCH (1,1) model

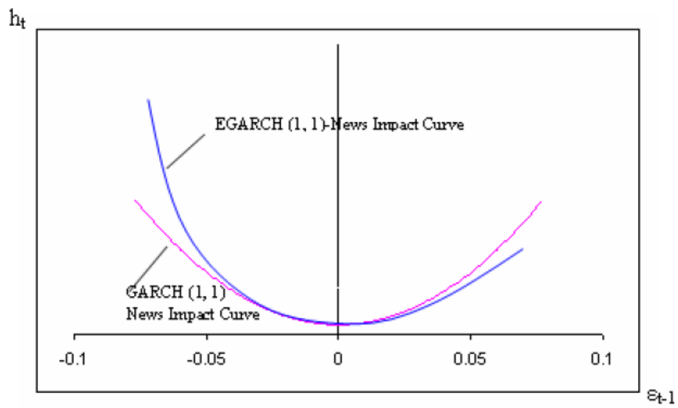


Figure 4. News Impact Curve comparison of EGARCH and GARCH

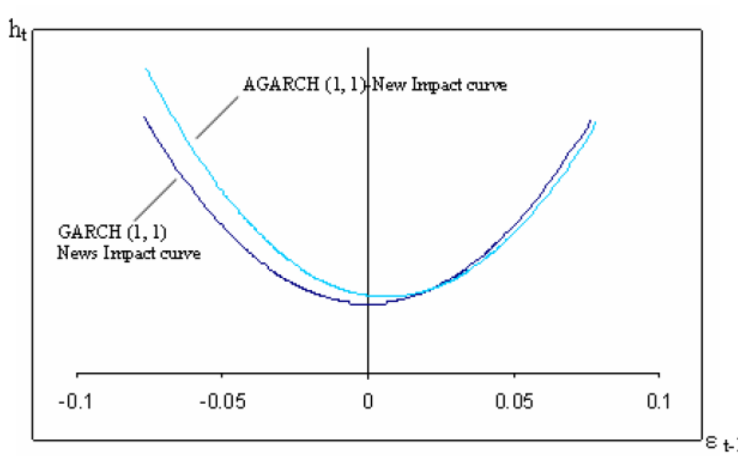


Figure 5. News Impact Curve comparison of AGARCH and GARCH

Table 1: a.) Correlation matrix of variables

	HSI	**SHA**	**OILP**	**HKIBK**	**FFR**	**PRIME**
HSI	1					
SHA	0.8401	1				
OILP	0.8175	0.7126	1			
HKIBK	-0.1287	-0.2118	-0.3466	1		
FFR	0.0490	-0.1169	-0.2379	0.8347	1	
PRIME	-0.0756	-0.1981	-0.3497	0.8924	0.93854	1

Notes:
1.) HSI refers to Hang Seng - Price Index;
2.) SHA refers to the Shanghai A - Share Price Index;
3.) OILP refers to the Crude Oil Price - month FOB;
4.) HKIBK refers to the Hong Kong Interbank - middle rate;
5.) FFR refers to the US Federal Funds Rate - middle rate;
6.) PRIME refers to the Hong Kong Prime Rate - middle rate.

b.) Correlation matrix of variables in First difference and in Logarithm

	DLHSI	**DLSHA**	**DLOILP**	**DHKIBK**	**DFFR**	**DLPRIME**
DLHSI	1					
DLSHA	0.0094	1				
DLOILP	-0.0117	0.0204	1			
DHKIBK	-0.0108	0.0089	0.0003	1		
DFFR	-0.0195	0.0061	-0.0088	-0.0099	1	
DLPRIME	0.0002	0.0004	0.0004	0.0006	4.5E-05	1

Notes:
1.) DLHSI refers to the first difference and logarithms of the Hang Seng - Price Index;
2.) DLSHA refers to the first difference and logarithms of the Shanghai A Share - Price Index;
3.) DLOILP refers to the first difference and logarithms of Crude Oil Price - month FOB;
4.) DHKIBK refers to the first difference and logarithms of the Hong Kong Interbank - middle rate;
5.) DFFR refers to the first difference and logarithms of the US Federal Funds Rate - middle rate;
6.) DPRIME refers to the first difference and logarithms of the Hong Kong Prime Rate - middle rate.

Table 2: The values of Akaike information criteria (AIC) with lags 1 to 10.

No. of lag	AIC(K)
1	-8.11
2	-8.113**
3	-8.112
4	-8.112
5	-8.112
6	-8.112
7	-8.113
8	-8.113
9	-8.112
10	-8.112

Table 3 (a): The estimated coefficients of variable and ARCH Coefficients in AR (2) model

Variables	Coefficient	t-value
Constant	0.000255	1.03
DLHSI1	-0.009383	-0.633
DLHSI2	-0.002901	-0.196
DLSHA	**0.070552**	**7.67****
DLSHA1	**-0.029686**	**-3.21****
DLSHA2	-0.000152	-0.0163
DLOILP	**0.065776**	**5.86****
DLOILP1	**0.025979**	**2.31****
DLOILP2	0.004053	0.359
DHKIBK	**-0.005453**	**-12.6****
DHKIBK1	-0.000169	-0.345
DHKIBK2	**0.001017**	**2.24****
DFER	-0.002151	-1.65
DFER1	-0.001026	-0.765
DFER2	0.001061	0.813
DPRIME	**-0.013838**	**-2.44 ****
DPRIME_1	**-0.013593**	**-2.43 ****
DPRIME_2	-0.008434	-1.52

Notes: 1.) DLHSI refers to the first difference and logarithms of the Hang Seng - Price Index;

2.) DLSHA refers to the first difference and logarithms of the Shanghai A Share - Price Index
3.) DLOILP refers to the first difference and logarithms of Crude Oil-Brent Cur. Month FOB, U$ in bn.
4.) DHKIBK refers to the first difference of the Hong Kong Interbank - Middle Rate
5.) DFFR refers to the first difference of the US Federal Funds Rate - Middle Rate
6.) DPRIME refers to the first difference of the Hong Kong Prime Rate - Middle Rate
** refers to statistically significant at 1% level

Table 3 (b): The Estimated ARCH coefficient

Number of Lag	Coefficient	Std. Error
1	0.28077	0.01451
2	0.18501	0.01451

Note: ARCH 1-2 test: F(2, 4584)= 400.83 [0.0000]**

Table 4: The estimated results of GARCH (1, 1)

a) Conditional mean equation:

Variables	Coefficient	t-value
Constant	0.000700	3.92
DLHSI1	**0.038668**	**2.45****
DLHSI2	0.001605	0.0985
DLSHA	**0.042493**	**5.87****
DLSHA1	**-0.009803**	**-1.31****
DLSHA2	0.006809	0.94
DLOILP	**0.017571**	**2.04****
DLOILP1	0.010102	1.12
DLOILP2	0.001156	0.131
DHKIBK	**-0.007398**	**-3.08****
DHKIBK1	-0.001313	-0.660
DHKIBK2	0.000684	0.331
DFER	0.000185	-0.177
DFER1	0.000197	0.181
DFER2	0.000428	0.359
DPRIME	-0.002800	-0.615
DPRIME_1	-0.008494	-1.53
DPRIME_2	**-0.010109**	**-2.43 ****

Note: ibid

b.) Conditional variance equation:

	Coefficient	t-value
alpha_0	1.88292e-006	4.04
alpha_1	0.078502	7.50
Beta_1	0.916926	99.3

Notes: Asymptotic test: Chi^2(2) = 523.25 [0.000]**
Normality test: Chi^2(2) = 328.02 [0.000]**

Table 5: The estimated results of GARCH-M (1, 1)

a). Conditional mean equation:

Variables	**Coefficient**	**t-value**
Constant	0.000561	2.27
DLHSI1	0.038682	2.53**
DLHSI2	0.001707	0.107
DLSHA	0.042532	5.41**
DLSHA1	-0.009712	-1.36
DLSHA2	0.006851	0.909
DLOILP	0.017814	1.84
DLOILP1	0.010246	1.15
DLOILP2	0.001289	0.147
DHKIBK	-0.007384	-3.66**
DHKIBK1	-0.001291	-0.787
DHKIBK2	0.000694	0.487
DFER	-0.000176	-0.145
DFER1	0.000212	0.165
DFER2	0.000435	0.335
DPRIME	-0.002678	-0.608
DPRIME_1	-0.008422	-1.72
DPRIME_2	-0.009938	-2.58**
ht	0.914825	0.336

Note: ibid

b.) Conditional variance equation:

	Coefficient	**t-value**
alpha_0	1.89916e-006	3.12
alpha_1	0.0786910	7.93
Beta_1	0.916654	90.3

Notes: Asymptotic test: Chi^2(2) = 516.89 [0.0000]**
Normality test: Chi^2(2) = 324.64 [0.0000]**

Table 6: The estimated results of EGARCH (1, 1)

a.) Conditional mean equation:

Variables	**Coefficient**	**t-value**
Constant	0.000401	2.28
DLHSI1	0.046413	6.05 **
DLHSI2	0.010086	0.888
DLSHA	0.039713	5.8**
DLSHA1	-0.007644	-3.51**
DLSHA2	0.005226	0.753
DLOILP	0.016724	3.06**

DLOILP1	0.013153	0.753
DLOILP2	0.001001	0.198
DHKIBK	-0.007333	-2.43**
DHKIBK1	-0.001175	-0.493
DHKIBK2	0.000574	0.374
DFER	-9.5295e-005	-0.0488
DFER1	3.4364e-005	0.0273
DFER2	0.000453	0.368
DPRIME	-0.001606	-0.365
DPRIME_1	-0.008464	-1.75
DPRIME_2	-0.008833	-2.30**

Note: ibid

b.) Conditional variance equation:

	Coefficient	t-value
alpha_0	-0.119901	-4.20**
alpha_1	-0.061050	-5.64**
theta	-0.153817	10.4**
Beta_1	0.985017	289**

Notes: Asymptotic test: Chi^2(2) = 405.81 [0.0000]**
Normality test: Chi^2(2) = 273.30 [0.0000]**

Table 7: The estimated results of EGARCH-M (1, 1) models

a.) Conditional mean equation:

Variables	**Coefficient**	**t-value**
Constant	0.000457	1.30
DLHSI1	0.045921	2.77**
DLHSI2	0.010217	0.615
DLSHA	0.039668	4.99**
DLSHA1	-0.007646	-1.11
DLSHA2	0.005221	0.728
DLOILP	0.016987	1.77
DLOILP1	0.013039	1.24
DLOILP2	0.000914	0.103
DHKIBK	-0.007342	-3.41**
DHKIBK1	-0.001188	-0.755
DHKIBK2	0.000559	0.406
DFER	-7.7939e-005	-0.0503
DFER1	4.1184e-005	0.0334
DFER2	0.000450	0.380
DPRIME	-0.001664	-0.387
DPRIME_1	-0.008482	-1.75
DPRIME_2	-0.008911	-2.30**
ht	-0.410069	-0.197

Note: ibid

b.) Conditional variance equation:

	Coefficient	t-value
alpha_0	-0.116937	-4.25**
alpha_1	-0.0611017	-5.47**
theta	-0.153719	10.9**
Beta_1	0.985350	301**

Notes: Asymptotic test: Chi^2(2) = 407.15 [0.0000]**
Normality test: Chi^2(2) = 274.14 [0.0000]**

Table 8: The estimated results of Asymmetric GARCH (1, 1)

a.) Conditional Mean equation:

Variables	**Coefficient**	**t-value**
Constant	0.000378	2.04
DLHSI1	0.047638	3.08**
DLHSI2	0.006299	0.394
DLSHA	0.041093	5.26**
DLSHA1	-0.008621	-1.26
DLSHA2	0.005426	0.717
DLOILP	0.015760	1.76
DLOILP1	0.011641	1.33
DLOILP2	0.002152	0.249
DHKIBK	-0.007631	-3.52**
DHKIBK1	-0.001227	-0.784
DHKIBK2	0.000672	0.487
DFER	-0.000434	-0.348
DFER1	0.000330	0.253
DFER2	0.000359	0.263
DPRIME	-0.002722	-0.638
DPRIME_1	-0.008862	-1.98
DPRIME_2	-0.009760	-2.86**

Note: ibid

b) Conditional variance equation:

	Coefficient	**t-value**
alpha_0	5.350e-007	0.676
alpha_1	0.079493	8.68**
Beta_1	0.909643	87.4**
Gamma	0.005686	5.41**

Notes: Asymptotic test: Chi^2(2) = 523.25 [0.0000]**
Normality test: Chi^2(2) = 328.02 [0.0000]**

Table 9: The estimated results of Asymmetric GARCH-M (1,1) models

a.) Conditional Mean equation:

Variables	Coefficient	t-value
Constant	0.000266	1.04
DLHSI_1	0.048200	3.13**
DLHSI_2	0.006914	0.432
DLSHA	0.041124	5.26**
DLSHA_1	-0.008569	-1.25
DLSHA_2	0.005470	0.723
DLOILP	0.015980	1.79
DLOILP_1	0.011746	1.34
DLOILP_2	0.002253	0.261
DHKIBK	-0.007618	-3.54**
DHKIBK_1	-0.001209	-0.770
DHKIBK_2	0.000680	0.490
DFER	-0.000426	-0.341
DFER_1	0.000341	0.262
DFER_2	0.000367	0.268
DPRIME	-0.002619	-0.613
DPRIME_1	-0.008793	-1.97
DPRIME_2	-0.009608	-2.81**
ht	0.741374	0.307

Note: ibid

b.) Conditional variance équation:

	Coefficient	t-value
alpha_0	6.2459e-007	0.777
alpha_1	0.079599	8.68**
Beta_1	0.908944	85.3**
Gamma	0.005684	5.42**

Notes: Asymptotic test: Chi^2(2) = 516.89 [0.0000]**
Normality test: Chi^2(2) = 324.64 [0.0000]**

Table 10. Comparison of volatility and asymmetric analysis models

Model	log-likelihood	SC	HQ	AIC
EGARCH	13160.160	-5.6838	-5.6983	-5.7062*
EGARCH-M	13160.166	-5.6820	-5.6974	-5.7057
AGARCH	13150.676	-5.6797	-5.6942	-5.7021
AGARCH-M	13150.941	-5.6780	-5.6934	-5.7017
GARCH	13121.212	-5.6687	-5.6823	-5.6897
GARCH-M	13121.637	-5.6671	-5.6816	-5.6894

Understanding Employees' Organizational Citizenship Behaviors through the Mediating Role of Corporate Social Responsibility

Yenhui Ouyang
Assistant Professor
Department of Finance and Banking, Kun Shan University
Tainan, Taiwan
ouyang@mail.ksu.edu.tw

Abstract

Leader-member exchange (LMX) and employer-employee guanxi (personal connections) have received increasing amounts of attention in the workings of Chinese management and organization. The purpose of this study seeks to examine the impacts of LMX and employer-employee personal guanxi on organizational citizenship behaviors (OCBs), and test empirically whether this relationship is mediated by the emerging field of corporate social responsibility (CSR) in financial service personnel. Using a sample of two hundred and twenty-eight financial service employees, we tested several causal hypotheses pertaining to the antecedents and impacts of organizational citizenship behaviors by means of structural equation modeling to measure the relationship among these constructs. Research findings indicate that LMX and employer-employee guanxi positively affect organizational citizenship behaviors (OCBs), mediated by corporate social responsibility (CSR). The empirical results and managerial implications of the findings are discussed and directions for future research are suggested.

Keywords: Leader-member exchange (LMX), Employer-employee guanxi, Corporate social responsibility (CSR), Organizational citizenship behaviors (OCBs).

Jel classification: C12 ; M12 ; M14

I. INTRODUCTION

The quality of leadership is one of the primary areas of study, research, and practice in organizational behavior. Leader-member exchange theory (LMX) describes how leaders in groups maintain their position through a series of implicit exchange agreements with each member of the group that they lead, and explains how those relationships with various members can develop in particular ways. These relationships can be characterized as high (good) or low (bad) in quality and help to embed employees within organizations. Guanxi is a Chinese word and regarded as a key determinant to business success in modern Chinese society (Luo, 2000;

Leung, Wong & Wong, 1996). In recent decades, guanxi has increasingly been widely studied, such as ethics (Tan and Snell, 2002) and organizational behavior (Chen and Tjosvold, 2007). Employer-employee guanxi means the personal relationship between an employer and an employee that is developed largely from non-work related social interactions both inside and outside office hours (Cheung et al., 2009). Recently, many scholars have highlighted that employer-employee guanxi is directly and indirectly associated with work outcomes. However, no papers refer to the mediating effect of corporate social responsibility (CSR) in the relationships between LMX and employer-employee personal guanxi related to employees' organizational citizenship behaviors.

Corporate social responsibility (CSR) is a managerial framework for a corporation to improve its legitimacy. Recently, CSR has emerged as a social movement. In addition, leaders play important roles in setting the standard for social responsibility in organizations. CSR is becoming a deep-rooted concept and a progressively critical issue in the financial services industry, but there are still questions about whether organizations' spent resources on corporate social responsible is significantly associated with employees' organizational citizenship behaviors.

As the financial markets confront strong and unexpected competition, the relationship of employer-employee, beyond the employment contract, is more important than before. An interaction of high quality is characterized by a relationship that goes beyond the contract, and is likely to lead to extra-role organizational citizenship behaviors (Kanika, 2007). OCBs are considered intangibly precious for organizations attempting to strengthen their capability in competitive global markets.

Although previous studies have identified how the moral development and ethical behavior of employees affect attitudes, such as satisfaction and person-organization fit (Schminke et al., 2005; Maureen et al., 2008), the causal relationships among LMX, employer-employee guanxi, CSR, and OCBs have received very little empirical attention. Thus, understanding the relationship between employers and employees would be helpful to assist them in developing the culture of employees' OCBs through favorable corporate social responsibility. We posit that CSR is one of the important mediators between LMX and employer-employee personal guanxi with employees' OCBs.

The present study therefore aims to explore the causal linkages among these constructs in this context. Finally, in this paper we will not only integrate both the Western theory of LMX as a result of work-related exchanges and the Chinese conception of personal guanxi as a result of non-work related social interactions to examine their direct effects on employees' OCBs, but will also study their indirect effects via CSR.

II. REVIEW OF THE RELATED LITERATURE AND HYPOTHESES DEVELOPMENT

A. THE EFFECT OF LMX ON OCBs

The quality of relationships between supervisors and subordinates is often studied via LMX theory. LMX describes the relationship between a leader and a subordinate and how they influence each other in an organization and their interdependencies (Yukl, 1998; Scandura, 1999). Due to its origins from the role theory (Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964) and social exchange theory (Cropanzano & Mitchell, 2005), the LMX model suggests that supervisors form differential relationships with their subordinates, with qualities varying from low to high (Liden, Erdogan, Wayne, & Sparrowe, 2006). Higher-LMX subordinates received more preferential treatment, increased job-related communication, differential allocation of formal and informal rewards, ample access to supervisors, and increased performance-related feedback than lower-LMX subordinates (Elicker, Levy, & Hall, 2006; Graen & Uhl-Bien, 1995). These advantages for high quality LMX subordinates are likely to be related to positive outcomes (Kenneth, J. H., Ranida, B. H., & David, M. E., 2007) and may be willing to do extra-role tasks to which their leaders will reciprocate (Graen & Scandura, 1987).

The LMX and OCBs have become the foundation of a new age of managing a diversified workforce in the advent of a globalized world (May, C. L. et al., 2006). Past studies have found support for an association of LMX with organizational citizenship behavior (Ansari et al., 2007; Hackett and Lapierre, 2007; Ilies et al., 2007). OCBs are behaviors that are voluntary and not part of the normal role requirements, and not directly recognized by the formal reward system. OCBs are also innately moral in that the actor chooses to perform a behavior that is beneficial to another person, generally regarded as honorable. Research from a social exchange perspective has viewed OCBs as a contribution to the organization (Organ and Paine, 1999).

Moorman (1991) found a positive and significant relationship between a subordinate's perception of his or her leader's interactional behaviors and four of the five dimensions of OCBs. He concluded that when leaders behave in ways that employees perceive to be fair, considerate, kind, and they can accurately perceive the needs and feelings of their followers, the subordinates reciprocate with increased levels of altruism, courtesy, sportsmanship, and conscientiousness. Because the leader trusts a particular subordinate and provides certain advantages to him or her in terms of greater authority, the subordinate may develop a feeling that he (she) wishes to repay the favor to the leader. Accordingly, the favorable exchange relationship will bring about the citizenship behaviors from subordinates. This is further supported by May Chiun Lo (2006), where the positive reciprocity is influenced when subordinates receive favors from their superiors, this will cause the subordinates to feel gratitude and payback the friendly action of their superiors by performing OCBs.

Employees perceived that leadership will be positively related to their job involvement within their organizations. As a result, employees display a higher degree of OCBs to facilitate effective functionality in the organization. Bolino (1999) has pointed out that if the subordinates realized that they have limited control in-role performance, they would be more likely to rely upon extra-role behaviors to enhance their images and distinguish themselves from others (Thomas, Au, & Ravlin, 2003). OCBs can be explained based on the psychological contract between organization and employees. Therefore, the quality of the leader-subordinate relationship plays an important role in defining subordinate's overall job attitudes (Mulki et al., 2006). Consistent with the prior literature and results, we predicted that LMX has significant influence on the level of OCBs among subordinates as a high quality of LMX may motivate employees to display positive reciprocity to the leader and increased productivity beyond the formal employment contract. Accordingly, we hypothesize that:

H1: LMX has a positive association with subordinate OCBs.

B. THE EFFECTS OF EMPLOYER-EMPLOYEE GUANXI ON OCBs

Guanxi can be defined as a special type of relationship which contains trust, favor, dependence and adaptation (Wong, 1998; Farh et al., 1998). Guanxi networks are considered as important elements within family, work and social contexts in Chinese society (Peter and Humphreys, 2007) to an extent unparalleled in the West. A common conception by many Westerners is that guanxi is in some way unethical (Chan et al., 2002), but Chen and Francesco (2000) have highlighted the fact that Chinese culture is quite different from that of the West in many ways, and that its relative complexity and lack of a clear legal framework make guanxi necessary for the smooth running of society.

Employer–employee guanxi is a personal tie that employees develop with their employer from social interactions both inside and outside working hours, and it is particularly important in the Chinese context (Cheung et al., 2009). Firms in Chinese society tend to be owned by the founders and run by family members, resulting in more bureaucratic control and centralized decision making (Lok et al, 2004). Thus, promotion of employees is often highly associated with the founding families and their guanxi networks. However, most Western firms tend to be owned by shareholders and run by professional managers, so promotion is often related to individual competence and merits (El Kahal, 2002). Based on the literature developed above, we come to a conclusion that through developing good guanxi with their employers, employees who feel good about their jobs will in turn make voluntary efforts at work that go beyond the stated mission and task.

H2: Employer–employee guanxi is positively associated with employee OCBs.

C. THE MEDIATING ROLE OF CSR

Corporate social responsibility (CSR) is about how companies manage their business in an ethical way, taking account of their impact economically, socially, environmentally, and in terms of human rights (Roger, E. K., 2009). William (2009) views corporations as having an obligation to avoid harming the environment, to contribute positively to the local community, and to promote the well-being of their employees and treat them fairly. Jay et al. (2009) identifies a type of leadership style that can help firms get back to the subject of corporate social responsibility and remind business firms that they do have obligations to fulfill their social duty and moral obligations that go beyond maximizing their profits. A number of studies have explored the issues related to leaders who play decisive roles in the attitudes and behaviors of employees (Jaramillo et al., 2006; Mulki et al., 2007). Maureen et al. (2008) suggested that the actual fits between individual and organizational ethical values are important predictors of employee attitudes. Recently, Ingram et al. (2007) have explored the influence of a model of leadership style, and assess the impact on the ethical climate. Redington (2005) emphasized companies need to engage with CSR because it offers a better way of doing business. Sirota et al. (2005) also mentioned there is a strong positive relationship between employee morale and business success.

Hence, based on these prior findings, we can conclude leaders have significant influences on employee social responsibility, and employees in turn would offer extra-role contribution to their organization, which would lead to higher levels of organizational citizenship behaviors. In other words, CSR would mediate the relationship between employers and OCBs of employees. Taken together, we formulate the following hypotheses:

H3: LMX is positively associated with subordinate corporate social responsibility (CSR).

H3-1: CSR is a Mediator of the LMX and OCBs relationship such that the direct effect of LMX-OCBs becomes insignificant (or weakens) after CSR is considered.

H4: Employer–employee guanxi is positively associated with subordinate CSR.

H4-1: CSR is a Mediator of the employer–employee guanxi and OCBs relationship such that the direct effect of employer–employee-OCBs becomes insignificant (or weakens) after CSR is considered.

III. METHODOLOGY

According to the needs of each research construct and hypothesis, SPSS 15.0 for Windows and Amos 7.0 were used to analyze the data. The instrument was administered as a questionnaire survey to 500 employees drawing from twenty-five financial institutions in southern Taiwan. After deleting the incomplete ones, a sample size of 228 responses was received, yielding a response rate of 45.6%. Based on interviews with experts and the review of the relevant literature, this study measured LMX, personal guanxi, CSR, and OCBs, via a seven-point Likert scale, which range from “Strongly Disagree” (weighted 1) to “Strongly Agree” (weighted 7). Respondents were asked to answer questions on the five constructs. The survey period was from June, 2009 to October, 2009, with financial service employees used as the sample. The statistical procedures and measures used in this paper are methodologies recommended by Khong and Richardson (2003). These methodologies aim to find the causal relationships among these constructs and determine their significance, as well as estimating the predictive power of the model.

IV. ANALYTICAL PROCEDURES AND RESULTS

IV. i RELIABILITY AND VALIDITY

Before the testing of hypotheses, we analyzed the convergent validity, discriminant validity, and reliability of all the multiple-item scales, following the guidelines from previous research (Fornell and Larcker, 1981; Gefen and Straub, 2005). The measurement properties are reported in Tables 1 and 2.

Reliability was assessed in terms of composite reliability, which measured the degree to which items are free from random error and therefore yield consistent results. Composite reliabilities in our measurement model ranged from 0.9038 to 0.9537 (see Table 1), which is above the recommended cutoff of 0.70 (Fornell and Larcker, 1981; Nunnally and Bernstein, 1994). Convergent validity was assessed in terms of factor loadings and average variance extracted. According to the prior study, convergent validity requires a factor loading greater than 0.70 and an average variance extracted of no less than 0.50. As shown in Table 1, all items had significant factor loadings higher than 0.7. Average variances extracted ranged from 0.7671 to 0.8376, suggesting adequate convergent validity. Thus, all factors in the measurement model had adequate reliability and convergent validity.

Table 1 Reliability and factor loadings

Constructs/Measurement Items	Standardized loadings	CR	AVE
Leader-member exchange (LMX)		0.9038	0.8245
LMX1: Our leader encourages us to make great efforts toward the perspective of our company.	0.900***		
LMX2: Our leader is very friendly and always takes very good care his subordinates.	0.916***		
Employer-employee guanxi (GX)		0.9175	0.788
GX1: I have good guanxi with my employer, so my work goes more smoothly.	0.942***		
GX2: By establishing a good interaction with my employer out of the working hours, I can get more business resources.	0.822***		
GX3: I am very confident in my work because I have good guanxi with my supervisor.	0.895***		
Corporate Social Responsibility (CSR)		0.9537	0.8376
CSR1: Our company aggressively innovates the	0.904***		

technique to promote performance.			
CSR2: Our company cares considerably about the benefits of our customers and is responsible in advertising.	0.955*** 0.923***		
CSR3: The service attitude of financial service personnel is pretty good, and voluntarily helps customers to increase financial knowledge.	0.877***		
CSR4: Our company makes efforts in various CSR issues involving women, ethnic minorities, and disabled minorities.			
Organizational Citizenship Behaviors (OCBs)		0.9292	0.7671
OCB1: I always spend time listening to the unhappiness of other coworkers.	0.810***		
OCB2: The coworkers believe in the commitment that I give to him (her).	0.921***		
OCB3: I always inform the message of my job to my coworkers.	0.940***		
OCB4: In treating newcomers, I will not use a different attitude.	0.825***		

Note：*** means the values are significant at the 0.001 level.

Discriminate validity was assessed via comparisons of the square roots of the AVE values with the correlations between the latent constructs (Table 2). Fornell and Larcker (1981) assert that average variance shared between a construct and its measures (square root of the AVE) should be greater than the variance shared between the constructs and other constructs in the model. Table 2 shows the inter-construct correlations of the diagonal of the matrix. This showed that the shared variance between factors were lower than the average variance extracted from the individual factors, confirming strong discriminate validity (Fornell and Larcker, 1981). In summary, the psychometric properties of the scales are very good.

Correlation analysis focuses on the measurement of the degree of affinity between constructs and determines if the parent bodies are correlated. The Pearson coefficient of correlation was used to test if there were any significant correlations between the aspects of the degree of LMX, employer-employee guanxi, CSR and OCBs, and to find the degree of affinity between the aspects of constructs before we used SEM analysis to explore the causality of each aspect. In summary, the results showed that there were significant positive correlations between these constructs.

Table 2 Correlation matrix of latent constructs

Construct	(1)	(2)	(3)	(4)
(1) LMX	(.9080)			
(2) Employer-employee guanxi	.836(**)	(.8877)		
(3) CSR	.585(**)	.565(**)	(.9152)	
(4) OCBs	.625(**)	.540(**)	.719(**)	(.8758)

Note：All correlations are significant at the 0.01 level (2-tailed).

The square root of average variance extracted for observed constructs are in parenthesis in the diagonal.

IV. ii THE RESULTS OF THE STRUCTURAL MODEL

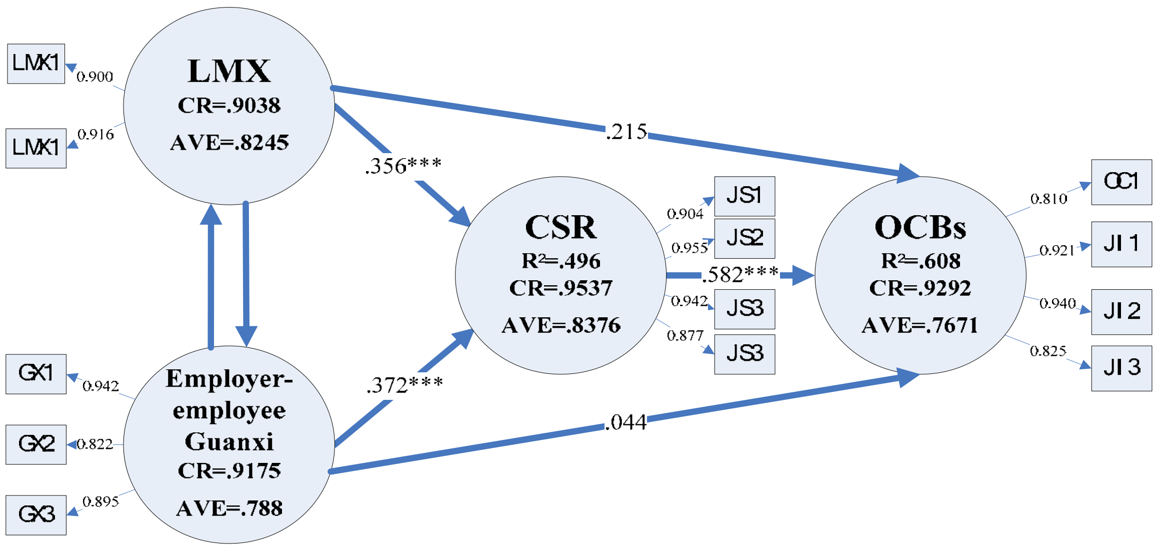
Structural relationships in the conceptual model were tested with AMOS 7.0. The maximum likelihood fitting function was used to estimated parameters and test hypotheses. Therefore, SEM is the most suitable analysis to estimate the strength of the causal relationships among these constructs. Bagozzi and Yi (1988) suggested a similar set of fit indices to examine the structural model (see Table 3). Overall, the model fits the data reasonably well ($x^2 / d.f.$=2.34, 60 degrees of freedom, GFI= 0.914, AGFI= 0.870, CFI =0.974, NFI= 0.956, IFI=0.974, RFI=0.943, PNFI=0.735, PGFI=0.603 and RMSEA 0.077). Thus, we could proceed to examine the path coefficients of the structural model.

Table 3 Results of the best fitting model

Fit Indices	Benchmark	Value
Absolute fit measures		
CMIN (χ 2)		140.289
DF		60
CMIN (χ 2)/DF	3	2.34
GFI (Goodness of Fit Index)	0.9	0.914
RMSEA (Root Mean Square Error of Approximation)	0.08	0.077
Incremental fit measures		
AGFI (Adjusted Goodness of Fit Index)	0.80	0.870
NFI (Normed Fit Index)	0.90	0.956
CFI (Comparative Fit Index)	0.90	0.974
IFI (Incremental Fit Index)	0.90	0.974
RFI (Relative Fit Index)	0.90	0.943
Parsimonious fit measures		
PGFI (Parsimonious Goodness of Fit Index)	0.50	0.603
PNFI (Parsimonious Normed Fit Index)	0.50	0.735

IV. iii PATH COEFFICIENTS AND PREDICTIVE ABILITY

Properties of the causal paths (standardized path coefficients) and t-values are shown in Fig 1. The effect of CSR on OCBs was significant (β= 0.582, $p<0.001$). As expected, LMX had a strong positive and highly significant influence on CSR (γ= 0.775). Employer-employee guanxi was found to be a significant factor in determining CSR (γ= 0.372, $p<0.001$). Altogether, LMX, employer-employee guanxi, and CSR accounted for 60.8% of the variance in OCBs of subordinates, with CSR exerting a stronger direct effect on OCBs of subordinates than LMX and employer-employee guanxi. About 50% of the variance in CSR was explained by LMX and employer-employee guanxi.



Note：*** means the values are significant at the 0.001 level.

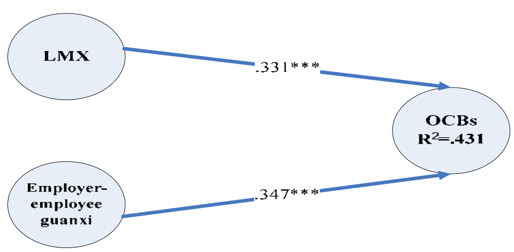
Figure 1 The relationship between LMX, Personal guanxi, CSR, and OCB

We tested two versions of our model. In the first model (Figure 1) we included all constructs, testing direct and indirect (via CSR) relationships between the two forms of LMX and employer-employee guanxi on OCBs. With the exception of two paths (LMX=>OCBs and employer-employee guanxi=>OCBs), all paths were significant.The direct and total effect of CSR on OCBs was 0.582. However, the total effect of LMX on OCBs was 0.421. LMX, despite showing a weaker direct effect than CSR on OCBs, exhibited a stronger total effect on OCBs than that of CSR. The direct, indirect, and total effects of LMX, employer-employee guanxi, and CSR on OCBs of subordinates are summarized in Table 4.

Table 4 The effects of LMX, employer-employee guanxi and CSR on OCBs of subordinates

	Direct effect	Indirect effect	Total effect
LMX	0.215	0.207	0.421
Employer-employee guanxi	0.044	0.216	0.261
CSR	0.582	N.A.	0.582

Baron and Kenny's (1986) logic states that a variable functioning as a mediator tests the mediating effect of corporate social responsibility. Figure 2 shows that the direct paths of LMX-OCBs and employer-employee guanxi-OCBs were significant at $p<0.001$. After introducing CSR as a mediator of the path between LMX with employer-employee guanxi and OCBs relationships, the direct path from LMX to OCBs (from $\gamma= 0.331^{***}$ to $\gamma= 0.215$) and from personal guanxi to OCBs (from $\gamma= 0.347^{***}$ to $\gamma= 0.044$), became insignificant, indicating a full mediating effect of CSR on the LMX-OCBs and employer-employee guanxi-OCBs relationships.



Note：*** means the values are significant at the 0.001 level.

Figure 2 Direct effect model

V. CONCLUSIONS

This study aimed to find what plausible factors have impacts on financial service personnel's corporate responsibility, which in turn affect their OCBs. Firstly, we demonstrated that there is a strong and positive relationship between LMX, employer-employee guanxi and OCBs. Secondly, we identified that LMX and employer-employee guanxi are the important antecedents of OCBs. Thirdly, we hypothesized and demonstrated empirically that LMX and employer-employee guanxi are also related to OCBs via CSR, whereas the path between LMX-OCBs and employer-employee guanxi-OCBs was fully mediated by CSR. Thus, CSR contributes to a better explanation of employees' OCBs in the context of LMX and employer-employee guanxi.

VI. MANAGERIAL IMPLICATION

One obvious implication of the present study is that LMX and employer-employee guanxi have a significant impact on employees' organizational citizenship behaviors via corporate social responsibility. Our empirical evidence suggests that the relationships between LMX-OCBs and employer-employee guanxi-OCBs are better explained when CSR is taken into account. LMX and employer-employee guanxi appeared to be the important determinants of CSR and employees' OCBs. LMX and employer-employee guanxi directly, and via CSR indirectly, explained 60.8 percent of the variance in employees' OCBs. Moreover, we could understand that there are significant positive correlations between LMX, employer-employee guanxi, corporate social responsibility, and organizational citizenship behaviors. In other words, if employees perceive a higher degree of CSR from their employers or within their organizations, they will naturally display a higher degree of OCBs to facilitate effective functionality in the organization. Our empirical results have provided reliable and valid measures of the constructs, allowing the supervisors of financial institutions to fulfill their CSR. In turn, employees are more aggressive on their extra-job or organizational citizenship behaviors.

In the wake of recent immoral scandals around the financial sectors, such as the event of structured notes, financial institutions face growing pressure from their customers and stakeholders. The initiative of corporate social responsibility becomes more important than before. Many well-known domestic and international periodicals such as Common Wealth, Forbes, and Fortunes also measure corporate social performance for readers to appraise the moral and ethical behaviors of enterprises. Engaging in the promotion of corporate social responsibility, the employers must work together with their employees to set the rules of corporate social responsibility. The Economist (2008) reported that practitioners believe that CSR behaviors result in subordinates feeling proud to identify with work organizations that have a favorable reputation, and contributes to long-term benefits for the firm. Thus, organizational employers need to recognize the importance of development and implementation of CSR. Through this recognition, the employees will be positively influenced by their association with an esteemed work organization and improve their organizational citizenship behaviors.

VII. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

There are several limitations in this study. First, it has relied primarily on samples drawn from financial institutions in southern Taiwan, thus the findings cannot be generalized to other firms in Taiwan. We also suggest that follow-up research improve the sampling method or choose employees of other service industries as the object and further test the exterior validity of the structural model. It would also be worthwhile to identify the importance of LMX and employer-employee guanxi under different economic conditions (e.g. during or after the worldwide “financial tsunami”).

Second, future studies should examine the influence of LMX and employer-employee guanxi in other Asian contexts, particularly where Chinese culture has a strong influence. Additionally, future research could put more effort into exploring other plausible moderators which have moderating effects between LMX-OCBs and personal guanxi-OCBs. Finally, longitudinal studies should be expanded to understand the development of LMX and employer-employee guanxi more thoroughly and provide more conclusive findings on the direction of causality between LMX-employee OCBs, and employer-employee guanxi OCBs in different contexts.

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