The International Journal of
Business and Finance Research

VOLUME 5 NUMBER 1 2011

CONTENTS

STOCK REPURCHASE ANNOUNCEMENTS AND STOCK PRICES EVIDENCE FROM TAIWAN

Li-Hua, Lin, Transworld Institute of Technology, Taiwan
Szu-Hsien Lin, National Chung Cheng University, Taiwan
Ya-Chiu Angela Liu, National Chung Cheng University, Taiwan

ABSTRACT

This paper uses an event study methodology to examine the stock price behavior surrounding announcements of stock repurchases made by Taiwan firms from 2000 to 2008. Our analysis shows that stock prices go up in response to stock repurchase announcements. We also find the announcement effects between various industries to be significantly different; the announcement effect is greatest in the financial industry and least in the electronics industry. Finally, firms which fully executed stock repurchases were confirmed to have experienced a relatively large stock price decline in the pre-announcement period compared with those which executed less than 10% stock repurchases; however, there is no significant difference in their announcement effects.

JEL: G14

KEYWORDS: Stock repurchases, event study, abnormal return, cumulative abnormal return

INTRODUCTION

On June 30, 2000, the Taiwan Legislative Yuan promulgated amendments in the provisions of the Securities Exchange Act. Following the formal implementation of these amendments on August 9 of the same year, the treasury stock system officially allowed firms to repurchase their shares in the open market. Nevertheless, companies were limited to the following objectives: (1) transferring shares to employees; (2) repurchasing shares for the exercise of stock options and convertible bonds; and (3) protecting corporate credit and the interest of stockholders (Taiwan Securities Act 28-2). The data from the Market Observation Post System of the Taiwan Stock Exchange show that the number of listed companies that issued at least a repurchase announcement from August 9, 2000 to October 31, 2008 is 459, about 60.47% of the total number of listed firms.

The Taiwan stock market has been shaken several times. After 2000, Taiwan went through two political administrations and several global economic downturns, most notably the subprime crisis emanating from the US and developing into the global financial tsunami of 2008. Every time stock prices plummet, many companies announce programs to buy back their own shares. In view of all these, our study aims to examine the effects of stock repurchase announcements by listed companies on their respective stock prices, and to find out whether there is an "announcement effect". If so, this study further examines the issues of whether the announcement effect varies across industries and of whether the extent to which the repurchase is executed really matters.

While previous studies employ shorter periods (i.e., from half a year to 5 years), this paper uses a total of 8 years of data (August 2000 to October 2008) under the assumption that a longer period will help confirm the hypotheses tested. Based on the concept that standardized abnormal returns and cumulative returns may reduce the effects of disturbance events on stock returns, this study adopts the Market Model Hypothesis and the OLS method of event study to estimate the standardized abnormal return (SAR) and the standardized cumulative abnormal return (SCAR) of the sample. Both the standardized cross-sectional *t*-test and nonparametric sign test are used to test the hypotheses.

The remainder of the paper is organized as follows. The next section discusses the literature review and hypotheses. The third section describes the data and methodology used in the analysis. The fourth section presents and analyzes empirical results, and the final section concludes the paper.

LITERATURE REVIEW AND HYPOTHESES

In many countries, an open market stock repurchase has become one of the popular ways for firms to distribute cash flows to their shareholders. For example, in 1994 firms in the USA announced more than $65 billion stock repurchases (Ikenberry et al., 1995, 182). Moreover, stock repurchases hit a record of $176 billion in 1996 (Otchere and Ross, 2002, 512).

Firms buy back their own shares for various reasons, such as signaling, agency costs involving the problem of free cash flows, capital market allocation, tax-motivated substitution of repurchases for dividends, desired capital adjustments (Grullon and Ikenberry, 2000; Baker, et al., 2003), concentration of ownership, and profitability per share (Hsu, 2000, 508). Repurchasing shares of the firm's stock may signal that current stock prices are below the stock's intrinsic value. It may also signal to investors that managers are confident about the company's earnings prospect. In the literature, signaling is the most widely studied theory behind share repurchases. Comment and Jarrell (1991) compare three forms of common stock buybacks in the U.S. markets, i.e., Dutch auction, fixed-price self-tender offers, and open-market share repurchases, and find that each of their announcements is associated on average with significant and positive excess stock returns. Meanwhile, the announcement stock returns are attributed to recent firm-specific returns but not to recent general market performance, providing broad support for the signaling theory. In other words, share buybacks increase stock prices because they are credible managerial signals that the offering firm's stock is undervalued. Ikenberry et al.

(1995) examine firm performance following open market share repurchase announcements during the period 1980–1990. They find that the average market reaction, measured from two days before through two days following the announcement, is 3.54%. As the percentage of shares announced for repurchase increases, the market reaction increases, and as firm size increases, announcement returns decline substantially. The average abnormal four-year buy and hold return measured after the initial announcement is 12.1%. For value stocks, companies are more likely to repurchase shares because of their being undervalued; the average abnormal return is 45.3%. Liu and Ziebart (1997) also report that stock price climbs in response to open-market repurchase announcement. The results above are echoed by research conducted by Lie (2005), Hatakeda and Isagawa (2004), and Zhang (2002), which confirm that stock repurchase announcements yield a positive effect on stock prices. Chen (2003) also discovers that stock repurchase announcement is useful in stabilizing a company's share price. Moreover, staggering abnormal returns can also take place three trading days after the announcement is made. This study therefore presents the first hypothesis as follows:

Hypothesis 1: Stock repurchase announcements cause a significantly positive response from the market.

The announcement effects may vary across industries. Chen (2003) observes that the impact is stronger on the financial industry than on conventional industry, and the announcement effect on the electronics industry is the weakest and is of no significance. The cumulative abnormal return (CAR) for the electronics industry is not significant because of stock repurchase announcement during the estimation period. The effect on the financial industry is stronger than that on conventional industry, while the overall period influenced by repurchase announcement in the financial industry is shorter than that in conventional industry. During the event period (0, 4), the cumulative abnormal return of the financial industry is 6.42%, higher than the conventional industry's 4.66%. However, while the event period extends to (0, 9), the cumulative abnormal return of the financial industry (6.53%) is lower than that of the conventional industry (7.03%). Chi et al. (2007) also find that companies from industries other than electronics have a considerably higher average CAR than companies of the electronics industry before and after the declaration of a stock repurchase. This study therefore establishes the second hypothesis as follows:

Hypothesis 2: Stock price reactions differ across industries after the declaration of a stock repurchase. The announcement effect on the financial industry is expected to be the greatest, while the effect on the electronics industry is expected to be the least.

The stock price reaction may also differ depending on the frequency of a stock repurchase program. Chan (2003) reports that when a stock repurchase program is first announced, stockholders obtain a significantly positive average abnormal return during the announcement window (day -2 to day +2). While the frequency of stock repurchase program increases, the information signaling effect of the announcement decreases gradually, but not significantly. When the stock repurchase program is executed up to five times, the abnormal return on the announcement window becomes statistically insignificant.

Whether firms actually execute share buyback programs after the announcement may also influence stock prices. Hatakeda and Isagawa (2004) find that a firm in their study's execution group will experience a larger stock price decline before its announcement and a larger price increase over the post-announcement period than a firm in the non-execution group. The difference in the stock price behavior for the post-announcement period between the two groups reveals that investors may gradually recognize the firm's decision following the announcement, though they may not immediately recognize what decision a firm has made. Their findings support the undervaluation/investment hypothesis.

A firm that experiences a large stock price decline before the announcement will be more likely to buy back its shares. If a firm views the market price as temporarily undervalued, the manager who is optimistic about the firm's earning prospect will consider the low stock price as an excellent investment opportunity (a positive net present value). In addition, the more undervalued the stock price is, the more willing the firm is to buy back its shares. Lie (2005) compare firms that merely announced a repurchase program without repurchasing shares during the announcement quarter, and firms that repurchased shares more than 1% of the total asset value during the announcement quarter. The result shows that the actual repurchases, rather than the announcements of the repurchase programs, are more likely to indicate performance improvement. Based on the statements above, this study proposes the third hypothesis as follows:

Hypothesis 3: Firms' actual repurchase of shares following an announcement may affect open market stock prices; the larger the ratio of shares actually repurchased, the stronger the announcement repurchasing effect.

DATA AND RESEARCH METHOD

The data gathered in this study consist of listed companies that issued repurchase announcements from August 9, 2000, the effective date of the formal implementation by the Treasury Stock System, to October 31, 2008. As stated above, the effect of the repurchase announcement may differ according to the number of times the announcement is made. In this case, only those who issued a repurchase announcement for the first time were considered in this research; all the rest were eliminated from the sample. Thus, the data were initially composed of 459 firms. The Ordinary Least Squares (OLS) of the event study method was applied to the data collected from the Taiwan Daily News in order to select an estimation market model. After eliminating firms with insufficient data, the sample was trimmed down to 413 firms. Table 1 shows the yearly distribution of different industries and actual repurchase implementation ratios. During the period 2000 to 2008, the highest number of companies that repurchased stock was in 2000, followed by the year 2004, and then 2008. In 2008, the number grew increasingly, apparently relative to the economic boom and stock price fluctuations. For industry sectors, the number (25) of financial industry repurchasing stock is the smallest and is concentrated in 2000 while the number (228) of electronics industry is the highest. The number (160) of conventional industry is in second place, but it also has the highest number (79) in 2000. As for the actual stock repurchase ratio, the number (43) of ratio below 10% is the smallest, the number (243) of ratio ranging from 10 to 100 percent is the highest, and the number (127) of 100% is in second place.

Table 1: Descriptive Statistics for Share Repurchase Announcements between August 2000 and October 2008

Year	Share Repurchase Firms					Repurchase Implementation Ratio (N)		
	N	Fraction (%)	Financial Industry	Electronics Industry	Conventional Industry	Below 10%	10% – 100%	100%
2000[a]	129	31.23	16	34	79	14	74	41
2001	47	11.38	1	27	19	7	31	9
2002	31	7.75	2	19	10	6	16	9
2003	36	8.47	0	25	11	4	22	10
2004	68	16.46	1	56	11	2	40	26
2005	21	5.08	0	12	9	3	12	6
2006	13	3.15	1	12	4	3	12	2
2007	15	3.63	0	17	2	1	10	8
2008[b]	53	12.83	4	26	15	3	26	16
Total	413	100	25	228	160	43	243	127

This table shows the summary statistics of share repurchase announcements. [a] From August 9, 2000 to the end of 2000. [b] From January 1, 2008 to October 31, 2008. This study built the sample from the database of Taiwan Economic Journal, excluding observations with insufficient data and repurchase announcements that were not the first time.

The main objective of the event study methodology is to examine the effect of each event (e.g., stock repurchase announcement) on the stock price, which may result in abnormal returns (AR). The data are used to understand the market prices of securities and to see whether there is any correlation with any specific event.

When using the daily rate of return to establish an estimation model, the estimation period ($t1$-$t2$ in Figure 1) falls between 100 to 300 days. An estimation period that is too short may undermine the predictive power of the forecasting model; an estimation period that is too long may produce an unstable model due to structural variations occurring within the period. There are no objective criteria for the length of the period ($t3$-$t4$ in Figure 1). The daily rate of return ranges from two to 121 days (Shen and Li, 2000b, 23). Previous studies set the event date (day 0) on the day the repurchase announcement was made by the director. The estimation period prior to the declaration is between 21 and 121 days (-121, -21) before the event day. On the other hand, the event period starts from 20 days before the announcement and 20 days after the announcement (-20, 20), for 41 days.

Since prices of financial properties are often characterized by having a fat tail and high peaks (otherwise known as the ARCH phenomenon), Yang (2007, 146-147) assumes that too many fluctuations crowd together in this scenario. Failure to consider this trend may lead to overestimation of the ß coefficient in the estimation period of the market model. Meanwhile, ß variance of the event period may vary over time, and the phenomenon that stock prices soars for 3 consecutive days after the event may be a kind of "clustering effect" in the ARCH. GARCH (1, 1) is usually used to correct this problem (Chen and Lee, 2000a, 119). However, the event periods in this research are widely distributed over 8 years. There is an enormous difference among the event dates of the companies. The observed values of the stock prices are not likely to be simultaneously affected by the same external factors, and the abnormal return of the stock prices of each company is more independent. Besides, the OLS method is used to calculate the residual of the samples. The result undergoes a D-W autocorrelation and ARCH tests, and reveals that most results are not at all significant. In other words, the autocorrelation issue in the data is not particularly serious and does not warrant an ARCH model. If the abnormal returns and cumulative returns of the firms are standardized and averaged out, it may reduce the effects of disturbance events on stock returns. The distribution of abnormal rate of return is then converted to standardized normal distribution and conforms to the conditions of identical distribution. Besides, this article uses the GARCH (1, 1) approach to estimate the sample. Out of 413 firms in the sample, 114 firms (27.6%) resulted in an extremely large AR (actual rate of return on the event date minus the projected rate of return) and CAR values. This produced serious damage on the average abnormal return. This study therefore adopts the Market Model Hypothesis and the OLS method of event study to estimate the standardized abnormal return (SAR) and the standardized cumulative abnormal return (SCAR) of the sample.

The model is illustrated as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}, \tag{1}$$

where R_{it} is the return rate of sample stock on day t, R_{mt} is the return rate of market investment combination on day t, α_i and β_i are regressive coefficients, and ε_{it} is day t's error term, i.e., $\varepsilon_{it} \sim N(0, \sigma^2)$. The expected daily return rate $E(\hat{R}_{it})$ of the individual stock is calculated as follows:

$$E(\hat{R}_{it}) = \hat{\alpha}_i + \hat{\beta}_i R_{mt} \tag{2}$$

The difference between $E(\hat{R}_{iE})$ and the real daily return rate R_{iE} is the abnormal return rate AR_{iE} in the following:

$$AR_{it} = R_{it} - E(\hat{R}_{it}), \quad t = \text{-20,…, +20.} \tag{3}$$

Adding up the daily abnormal return rates in the event period (t_3, t_4), we can obtain the accumulated abnormal return rate CAR_i of the individual firm as follows:

$$\text{CAR}_i = \sum_{t=t3}^{t4} AR_{it} \tag{4}$$

because $AR_{it} =$ the return of research event + the return of disturbance event. To remove the impact of these disturbance events, Shen and Li (2000b, 8) recommend a procedure of standardizing and then averaging (average SAR_{iE}) all the firms' abnormal returns in the event period. The procedure may reduce the effects of disturbance events on stock returns.

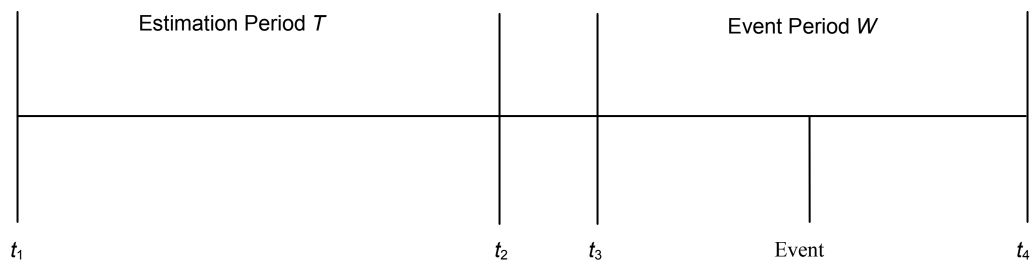
$$\text{SAR}_{iE} = \frac{AR_{iE}}{\sqrt{VAR(AR_{iE})}} \text{ and average SAR}_{iE} = \frac{\sum_{i=1}^{N} SAR_{iE}}{N}. \tag{5}$$

Likewise, we also obtain an average SCAR$_{iE}$ as follows:

$$\text{average SCAR}_{iE} = \frac{\sum_{i=1}^{N} SCAR_{iE}}{N}. \tag{6}$$

When doing the hypothesis testing, we use not only the *t*-test of Standardized-Residual Cross-Section Method but also the nonparametric sign test, as Shen and Li recommend (2000a, 62).

Figure 1: Length of Event and Estimation Period



This figure shows the length of event and estimation period in terms of time horizon.

EMPIRICAL RESULTS

The empirical results show that the entire sample yields a significantly negative SAR (both the standardized cross-sectional *t*-test and nonparametric sign test show a significant level of 5%) on the following periods: day -1 (the day before the repurchase announcement date) to day -13, day -17, and day -20. This means the stock price is clearly undervalued. On the other hand, a significantly positive SAR is noted on day +1 (the day following the repurchase announcement date) and day +2. This shows an apparent announcement effect and supports Hypothesis 1 (*Stock repurchase announcements cause a significantly positive response from the market*). Although SAR is positive on the event date, the *t*-test is not significant. SAR is largest on the first day (day +1) but the announcement effect clearly declines. The nonparametric sign tests up to day +3 and day +4 are not significant either. SAR is consistently negative before the announcement and consistently positive after the announcement. This reflects the SCAR presented in Table 2. Since the stock price is obviously low before the event date, SCAR becomes positive only on day +14 after the repurchase announcement, and a significant negative value was detected only from day -20 to day +7.

When the industries are classified into three categories, Table 3 and Table 4 show significant differences in the announcement results across industries. For the financial industry, the first day after the event date shows the strongest announcement effect (SAR is 1.47%, as opposed to 0.84% for the electronics industry and 1.18% for the conventional industry). However, the declining speed of the outcome is also fastest in the financial industry. Since the stock price prior to the event is not seriously low (with occasional positive SARs), SCAR is easily converted to a positive value (i.e., one day after the repurchase announcement (day+1) and day +14 to day +20 showed equally significant results in the two tests). The repurchase effect is weakest in the electronics industry. SCAR is negative until day +20 of the event. The conventional industry falls between the two other industries. Based on the two tests, values become significantly positive on the 8th day after the announcement and from day +16 to day +20. One-way ANOVA test shows that the industry factor correlates SAR (*p* value is 0.054). The *t*-test confirms a significant difference between the SAR of the financial industry and that of the electronics industry (*p* value is 0.017). Other industries do not yield any significant difference. This result supports Hypothesis 2 (*Stock price reactions differ across industries after the declaration of a stock repurchase. The announcement effect on the financial industry is expected to be the greatest, while the effect on the electronics industry is expected to be the least).* The outcome mirrors those of Chen (2003) and Chi et al. (2007).

Table 2: Average Abnormal Return and Cumulative Abnormal Return - Entire Sample

Event date	SAR	SCAR	*t*-test	Sign test	Event date	SAR	SCAR	*t*-test	Sign test
-20	-0.1273	-0.1273	-2.71***	3.40***	+1	1.0078	-2.1295	13.00***	9.79***
-19	-0.043	-0.1761	-0.85	1.78	+2	0.5695	-1.56	8.20***	5.07***
-18	-0.0627	-0.2388	-1.17	1.48	+3	0.2627	-1.2973	3.98***	1.43
-17	-0.1255	-0.3583	-2.44***	3.00***	+4	0.1719	-1.1254	3.11***	1.03
-16	-0.0331	-0.3914	-0.63	0.64	+5	0.0947	-1.0307	1.60	0.25
-15	-0.0523	-0.4436	-0.92	1.53	+6	0.1225	-0.9082	2.32**	0.93
-14	-0.0843	-0.5279	-1.47	2.51**	+7	0.1055	-0.8027	1.96*	0.74
-13	-0.1496	-0.6775	-2.83***	3.69***	+8	0.1006	-0.702	1.84*	1.82
-12	-0.2323	-0.9098	-4.41***	4.87***	+9	0.1691	-0.5329	2.93***	1.43
-11	-0.1725	-1.0823	-3.39***	3.99***	+10	0.0964	-0.4364	1.84*	1.33
-10	-0.2007	-1.2762	-3.34***	5.13***	+11	0.1087	-0.3278	1.98**	0.54
-9	-0.1336	-1.4098	-2.26**	1.97**	+12	0.146	-0.1818	2.79***	1.43
-8	-0.2349	-1.6508	-4.20***	3.40***	+13	0.1286	-0.0532	2.22**	0.44
-7	-0.1673	-1.8181	-2.87***	3.59***	+14	0.0787	0.0255	1.47	0.25
-6	-0.2027	-2.0208	-3.49***	4.38***	+15	0.04	0.0655	0.73	0.34
-5	-0.2015	-2.2223	-3.50***	3.00***	+16	0.0587	0.1242	1.06	1.13
-4	-0.3308	-2.5531	-5.32***	5.56***	+17	0.0927	0.2169	1.60	0.05
-3	-0.1947	-2.7478	-3.27***	3.99***	+18	0.0859	0.3028	1.66*	1.13
-2	-0.2528	-3.0005	-3.80***	2.80***	+19	0.0634	0.3662	1.21	0.54
-1	-0.2546	-3.2551	-3.58***	3.10***	+20	0.035	0.4011	0.67	0.84
0	0.1178	-3.1373	1.60	2.02**					

*This table shows the estimate result of the standardized abnormal return (SAR) and standardized cumulative abnormal return (SCAR) of the sample. We use the Market Model hypothesis and the OLS method of event study to estimate them. The event period starts from 20 days before the announcement (-20) and 20 days after the announcement (+20). The t-test refers to the t-value of the standardized-residual cross-section. Sign test refers to the nonparametric test. These tests examined the significant levels of SAR. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.*

Table 3: Average Abnormal Return and Cumulative Abnormal Return—Financial Industry and Electronics Industry

A Financial Industry					B Electronics Industry				
Event date	SAR	SCAR	*t*-test	Sign test	Event date	SAR	SCAR	*t*-test	Sign test
-20	0.1515	0.1515	0.65	0.2	-20	-0.1309	-0.1309	-2.13**	2.38**
-19	0.0394	0.1909	0.18	0.6	-19	-0.0717	-0.2025	-1.09	1.99**
-18	0.127	0.3179	0.64	0.2	-18	-0.0433	-0.2458	-0.60	1.46
-17	-0.0811	0.2368	-0.54	1	-17	-0.1141	-0.36	-1.65	1.59
-16	0.1535	0.3903	0.66	0.6	-16	-0.0073	-0.3672	-0.11	0.13
-15	0.0698	0.46	0.26	0.2	-15	-0.0717	-0.4389	-1.02	2.25**
-14	-0.1207	0.3394	-0.56	0.2	-14	-0.0944	-0.5333	-1.31	2.65***
-13	-0.0404	0.2989	-0.16	0.6	-13	-0.2273	-0.7606	-3.29***	3.31***
-12	-0.2128	0.0861	-1.05	0.2	-12	-0.2012	-0.9618	-3.07***	4.11***
-11	-0.427	-0.3409	-1.98*	2.6**	-11	-0.1734	-1.1353	-2.53***	3.71***
-10	-0.5251	-0.866	-1.99*	2.2**	-10	-0.2277	-1.3629	-3.20***	4.11***
-9	0.2416	-0.6244	1.29	2.2**	-9	-0.256	-1.6189	-3.16***	2.25**
-8	-0.0063	-0.6307	-0.02	0.2	-8	-0.3138	-1.9327	-4.46***	3.31***
-7	-0.0682	-0.6989	-0.24	1	-7	-0.1641	-2.0968	-2.13**	2.65***
-6	-0.4197	-1.1186	-1.50	1	-6	-0.1921	-2.2889	-2.55**	3.05***
-5	-0.0559	-1.1744	-0.25	2.2**	-5	-0.1891	-2.478	-2.50**	1.59
-4	0.2119	-0.9626	0.77	1	-4	-0.3775	-2.8555	-4.97***	4.77***
-3	-0.4164	-1.379	-1.77*	0.6	-3	-0.2567	-3.1122	-3.45***	4.11***
-2	0.1611	-1.2179	0.69	1.4	-2	-0.2137	-3.3259	-2.30**	1.59
-1	0.0525	-1.1655	0.20	0.6	-1	-0.2859	-3.6118	-3.14***	2.25**
0	0.5627	-0.6028	1.70	1.4	0	0.0772	-3.5346	0.78	2.12**
+1	1.469	0.8662	5.66***	3.4***	+1	0.8396	-2.695	8.33***	6.09***
+2	0.5167	1.3829	2.12**	1.4	+2	0.4678	-2.2272	5.70***	3.71***
+3	0.1564	1.5393	0.64	0.2	+3	0.2495	-1.9776	3.36***	1.46
+4	0.3145	1.8538	1.25	0.2	+4	0.1335	-1.8441	1.93*	0.13
+5	0.1796	2.0334	0.72	0.2	+5	0.0569	-1.7872	0.77	0.40
+6	0.042	2.0753	0.18	0.6	+6	0.0706	-1.7166	1.04	0.26
+7	0.2687	2.3441	1.40	1.4	+7	0.0421	-1.6745	0.58	0.13
+8	-0.1245	2.2195	-0.51	0.2	+8	0.0244	-1.6501	0.34	0.93
+9	0.1318	2.3514	0.95	0.2	+9	0.1152	-1.5349	1.51	0.13
+10	0.2589	2.6103	1.30	1.4	+10	0.0721	-1.4628	1.07	0.53
+11	0.2258	2.836	1.20	1.4	+11	0.1003	-1.3625	1.34	0.66
+12	0.3316	3.1676	1.52	0.2	+12	0.0875	-1.275	1.28	1.19
+13	0.022	3.1896	0.08	1	+13	0.0913	-1.1836	1.20	0.79
+14	0.6208	3.8105	2.33**	1.4	+14	-0.0302	-1.2138	-0.45	1.06
+15	0.3264	4.1369	1.31	1.4	+15	-0.0075	-1.2213	-0.11	0.40
+16	0.2307	4.3676	0.88	0.6	+16	0.017	-1.2043	0.25	1.85*
+17	0.0759	4.4434	0.26	0.6	+17	0.0632	-1.1411	0.80	0.66
+18	0.2838	4.7272	1.06	1	+18	0.0595	-1.0815	0.90	1.06
+19	0.1661	4.8933	0.58	0.6	+19	0.0004	-1.0811	0.01	0.93
+20	0.1502	5.0435	0.80	0.2	+20	-0.0288	-1.1099	-0.42	0.66

*This table shows the estimate result of the standardized abnormal return (SAR) and standardized cumulative abnormal return (SCAR) of the sample. We use the Market Model hypothesis and the OLS method of event study to estimate them. The event period starts from 20 days before the announcement (-20) and 20 days after the announcement (+20). Panel A shows the results for the financial industry. Panel B shows the results for the electronics industry. The t-test refers to the t-value of the standardized-residual cross-section model. Sign test refers to the nonparametric test. These tests examined the significant levels of SAR. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.*

Table 4: Average Abnormal Return and Cumulative Abnormal Return—Conventional Industry

Event Date	SAR	SCAR	*t*-Test	Sign-Test	Event Date	SAR	SCAR	*t*-Test	Sign-Test
-20	-0.1657	-0.1657	-2.19**	2.53**	+1	1.1753	-1.7918	8.94***	7.12***
-19	-0.0149	-0.1959	-0.18	0.72	+2	0.7226	-1.0692	5.55***	3.16***
-18	-0.1204	-0.3163	-1.38	0.72	+3	0.2981	-0.7711	2.32**	0.63
-17	-0.1487	-0.4488	-1.72*	2.53**	+4	0.2043	-0.5668	2.13**	1.58
-16	-0.0991	-0.548	-1.08	1.11	+5	0.1354	-0.4314	1.29	0.00
-15	-0.0436	-0.5916	-0.44	0.16	+6	0.209	-0.2224	2.37**	1.42
-14	-0.0642	-0.6558	-0.63	0.79	+7	0.1704	-0.052	1.92*	0.79
-13	-0.0558	-0.7116	-0.65	1.74*	+8	0.2444	0.1925	2.74***	1.74*
-12	-0.2797	-0.9913	-2.98***	2.85***	+9	0.2518	0.4443	2.52***	2.06**
-11	-0.1315	-1.1228	-1.62	0.95	+10	0.1058	0.5500	1.17	0.95
-10	-0.1109	-1.2163	-1.01	2.47**	+11	0.1023	0.6524	1.15	0.63
-9	-0.0172	-1.2335	-0.18	1.35	+12	0.2002	0.8526	2.31**	0.79
-8	-0.1584	-1.4085	-1.75	1.58	+13	0.1983	1.0509	2.11**	1.26
-7	-0.1873	-1.5958	-1.99**	2.21**	+14	0.1493	1.2001	1.67*	1.11
-6	-0.1839	-1.7797	-1.92*	3.00***	+15	0.0628	1.2629	0.63	0.63
-5	-0.2419	-2.0216	-2.51**	2.06**	+16	0.0912	1.3542	0.95	0.16
-4	-0.349	-2.3706	-3.18***	3.64***	+17	0.1374	1.4916	1.55	0.63
-3	-0.0717	-2.4423	-0.68	1.26	+18	0.0926	1.5842	1.09	0.95
-2	-0.3732	-2.8155	-3.64***	3.16***	+19	0.137	1.7212	1.79*	0.00
-1	-0.2579	-3.0734	-2.09**	2.06**	+20	0.1078	1.8290	1.25	0.63
0	0.1062	-2.9671	0.91	0.16					

*This table shows the estimate result of the standardized abnormal return (SAR) and standardized cumulative abnormal return (SCAR) of the sample. We use the Market Model hypothesis and the OLS method of event study to estimate them. The event period starts from 20 days before the announcement (-20) and 20 days after the announcement (+20). The t-test refers to the t-value of the standardized-residual cross-section model. Sign test refers to the nonparametric test. These tests examined the significant levels of SAR. . ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.*

With regard to the actual implementation ratio of the stock repurchase, the sample is divided into 3 groups: 10% and below, 100%, and the percentage in-between. In verifying Hypothesis 3, only the first two groups were compared. Table 5 shows that a SAR of less than 10% implementation ratio reveals a 5% level of significance in the two tests on the following days: day -20, day -12, day 0, and day +1. The SAR of 100% implementation ratio shows a 5% level of significance in the two tests on the following days: day -10, day -6, day-4, day -2, day +1, day +2, day +7, and day +13. The obvious announcement effects of both the two types of firms imply that investors do not realize the actual implementation outcome of the repurchase announcement. The stock price of the former is not as low as that of the second firm (i.e., SAR was at times positive). In this case, SCAR can easily become positive (3 days after the announcement for the first type; 10 days after the announcement for the second type; but both are of no significance). This study supports the view of Hatakeda and Isagawa (2004), that is, that firms that experienced a lower stock price before the repurchase announcement were more willing to buy back shares. The results, however, fail to support Hypothesis 3 (*Firms' actual repurchase of shares following an announcement may affect open market stock prices; the larger the ratio of shares actually repurchased, the stronger the announcement repurchasing effect*). The *t*-test results on the SAR of the two types of firms during the periods of day +0 to day +3 and day +0 to day +20 were found to be insignificant in the 5% level. Perhaps this is due to the failure in filtering some other factors; this warrants further study in the future.

Table 5: Average Abnormal Return and Cumulative Abnormal Return according to the Implementation Ratio of the Stock Repurchase

A-Sample with Less Than 10% Stock Repurchase Implementation Ratio					B-Sample with 100% Stock Repurchase Implementation Ratio				
Event date	SAR	SCAR	*t*-test	Sign test	Event date	SAR	SCAR	*t*-test	Sign test
-20	-0.2902	-0.2902	-2.32**	2.90***	-20	-0.1194	-0.1194	-1.43	2.40**
-19	-0.1244	-0.4146	-0.82	0.76	-19	-0.1284	-0.2669	-1.51	1.43
-18	0.0702	-0.3444	0.38	0.76	-18	-0.055	-0.3219	-0.61	0
-17	0.0915	-0.2529	0.61	0.46	-17	-0.0312	-0.3327	-0.36	0.80
-16	-0.1983	-0.4512	-1.41	0.76	-16	0.0186	-0.3141	0.22	1.33
-15	-0.0089	-0.46	-0.04	0.76	-15	0.0339	-0.2801	0.35	0.62
-14	0.1678	-0.2922	0.86	0.15	-14	0.0765	-0.2036	0.82	0.80
-13	-0.2327	-0.5249	-1.60	1.37	-13	-0.0595	-0.2631	-0.61	1.51
-12	-0.3794	-0.9043	-2.73***	2.29**	-12	-0.0639	-0.327	-0.77	1.86*
-11	-0.2660	-1.1703	-1.86*	1.98*	-11	-0.1252	-0.4522	-1.35	1.51
-10	-0.1254	-1.2957	-0.94	1.07	-10	-0.208	-0.6602	-2.25***	3.28***
-9	-0.2834	-1.5792	-2.17**	1.37	-9	-0.0299	-0.6901	-0.29	0.09
-8	-0.1661	-1.7453	-0.96	0.76	-8	-0.2213	-0.9114	-2.69***	1.86*
-7	-0.1101	-1.8553	-0.62	1.37	-7	-0.1472	-1.0586	-1.65	2.22*
-6	-0.0538	-1.9092	-0.37	0.46	-6	-0.2568	-1.3154	-2.71***	2.75***
-5	0.0012	-1.908	0.01	0.46	-5	-0.2346	-1.5499	-2.29***	1.86*
-4	-0.1822	-2.0902	-1.28	3.20***	-4	-0.3785	-1.9285	-3.31***	2.93***
-3	0.0539	-2.0363	0.33	0.15	-3	-0.2352	-2.1636	-2.11***	1.69*
-2	0.0486	-1.9877	0.30	0.46	-2	-0.3076	-2.4712	-2.80***	3.40**
-1	-0.1852	-2.1729	-0.82	0.76	-1	-0.2920	-2.7632	-2.40**	1.86*
0	0.5736	-1.5993	2.46**	2.29***	0	0.1177	-2.6455	-0.90	1.86*
+1	0.9439	-0.6554	3.80***	2.29**	+1	1.0787	-1.5667	7.72***	6.66***
+2	0.5127	-0.1427	2.73***	0.76	+2	0.4970	-1.0697	4.38***	2.04**
+3	0.2517	0.109	1.26	0.76	+3	0.2113	-0.8584	1.75***	0.27
+4	0.4058	0.5148	2.10**	1.37	+4	0.2049	-0.6535	2.00**	0.80
+5	0.0349	0.5497	0.17	1.07	+5	0.1273	-0.5262	1.36	0.80
+6	-0.0022	0.5474	-0.01	0.15	+6	0.0975	-0.4287	1.14	1.33
+7	-0.2121	0.3354	-1.51	2.29**	+7	0.2708	-0.1579	2.86***	2.04**
+8	0.0827	0.418	0.45	0.46	+8	0.0502	-0.1078	0.48	1.15
+9	0.0328	0.4508	0.20	0.46	+9	0.0639	-0.0438	0.63	1.15
+10	0.2620	0.7129	1.64	0.76	+10	0.1199	0.0761	1.26	1.69*
+11	0.1004	0.8133	0.74	0.46	+11	0.09	0.1661	1.02	0.62
+12	-0.0791	0.7341	-0.52	0.15	+12	0.1089	0.275	1.06	0.09
+13	0.1544	0.8886	0.75	0.15	+13	0.3269	0.6019	3.32***	2.04**
+14	0.2800	1.1686	1.73	0.76	+14	0.081	0.6829	0.83	0.44
+15	0.4581	1.6267	2.40**	0.76	+15	0.0245	0.7074	0.23	1.33
+16	0.2498	1.8765	1.53	1.07	+16	-0.0209	0.6865	-0.22	0.97
+17	0.3965	2.273	1.85*	0.46	+17	-0.0458	0.6408	-0.44	0.26
+18	0.2056	2.4786	1.24	0.15	+18	-0.0466	0.5941	-0.51	1.15
+19	-0.0700	2.4087	-0.43	0.76	+19	0.0235	0.6176	0.27	0.09
+20	0.0949	2.5036	0.57	0.76	+20	0.1476	0.7651	1.53	1.15

This table shows the estimate result of the standardized abnormal return (SAR) and standardized cumulative abnormal return (SCAR) of the sample. We use the Market Model hypothesis and the OLS method of event study to estimate them. The event period starts from 20 days before the announcement (-20) and 20 days after the announcement (+20). Panel A shows the results for samples with less than 10% stock repurchase implementation ratio. Panel B shows the results for samples with 100% stock repurchase implementation ratio. The *t-test refers to the t-value of the standardized-residual cross-section. Sign test refers to the nonparametric test. These tests examined the significant levels of SAR. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.*

SUMMARY AND CONCLUSION

Just as in many countries, open market stock repurchases have become one of the common ways for firms to pay out cash flows to their shareholders; the same situation is found in Taiwan recently. Every time stock prices plummet, a great many companies announce programs to buy back their own shares. In view of this fact, this paper aims to examine the effects of stock repurchase announcements made by listed companies on their respective stock prices, and to ascertain whether there really is an "announcement effect". In addition, the focal point of this study also includes the questions on whether the announcement effect varies across industries and whether it depends upon the actual execution of repurchase.

Our study obtained the data from the Market Observation Post System of the Taiwan Stock Exchange. Listed companies that issued a repurchase announcement for the first time from August 9, 2000 to October 31, 2008 were included in the sample, with a final count of 413 firms. We adopted the Market Model hypothesis and the OLS method of event study to estimate the standard abnormal return (SAR) of the sample and standard cumulative abnormal return (SCAR). The database of Taiwan Economic Journal (TEJ) was used to estimate the effects of stock repurchase on stock price. The result of the study supports our first hypothesis that stock repurchase announcements cause a significantly positive response from the market and our second hypothesis that the effects of repurchase announcement vary across the industries. The effect on the financial industry is the greatest, while the effect on the electronics industry is the least. We found that firms that experienced a larger decline in stock price prior to repurchase announcement were more willing to buy back their stocks. However, the result failed to support our third hypothesis that the larger the ratio of shares actually repurchased, the stronger the announcement repurchasing effect.

It is possible that some other factors were not filtered and ultimately affected the results. For example, the various reasons for share repurchase programs may lead to different empirical results. Besides, this study does not examine the issue of whether the firms that repurchase 100% of their shares have better longtime operating performance than those firms that repurchase their shares below 10%, which is an interesting issue and is worth looking into by future researchers.

REFERENCES

Baker, H. K., Powell, G.E. and Veit, E.T. (2003), Why companies use open-Market repurchases: a managerial perspective, *The Quarterly Review of Economics and Finance*, 43, 483-504.

Chan, C. H. （2003）, A study of signaling effects on stock sequential repurchase in Taiwan. Western Decision Science Institute 32nd Annual Meeting, Island of Kauai, Hawaii, U.S.A, 1-11.

Chen, D. (2003), The announcement effect of stock repurchase on share prices: an empirical analysis on the Taiwan Stock Exchange. *Commerce& Management Quarterly*, 4 (4), 377-400.

Chi, D. Wu, S. and Tsai, Z-R. (2007), A study on the stock repurchase announcements and the repurchase purposes of listed corporations in Taiwan. *Business Review*, 12 (1), 109 -138.

Comment, R., and Jarrell, G. (1991), The relative signaling power of Dutch auction and fixed price tender offers and open market share repurchases. *Journal of Finance*, 46 (4), 1243-1271.

Grullon, G., and Ikenberry, D.L. (2000), What do we know about stock repurchase? *Journal of Applied Corporate Finance*, 13, 31-51.

Hatakeda, T., and Isagawa, N.(2004), Stock price behavior surrounding stock repurchase announcements: evidence from Japan, *Pacific Basin Finance Journal*, 12(3), 271-290.

Hsu C. (2000), Investment: theories and applications, Third edition, Xin Lu Publishing, Taipei City.

Ikenberry, D., Lakonishok, J., and Vermaelen, T. (1995), Market underreaction to open market share repurchases. *Journal of Financial Economics*, 39, 181-208.

Lie, E.（2005）, Operating performance following open market share repurchase announcements. *Journal of Accounting and Economics*, 39, 411-436.

Liu, C.S., and Ziebart, D. (1997), Stock returns and open market stock repurchase announcements. *Financial Review*, 32, 709-728.

Lie, E. (2000), Excess funds and agency problems: an empirical study of incremental cash disbursements. *Review of Financial Studies*, 13, 219-248.

Otchere, I., and Ross, M. (2002), Do share buy back announcements convey firm-specific or industry-wide information: a test of the undervaluation hypothesis. *International Review of Financial Analysis*, 11, 511-531.

Shen, C. and Li, C. (2000a), Event study method: essential empirical studies on finance and accounting. Hwa Tai Publishing, Taipei City.

Shen, C. and Li, C. (2000b), Event study and ß-module–user's manual. Taiwan Economic Journal Co., Taipei City.

Yang Y. (2007), Time sequence analysis–economic and financial applications. Shuang Ye Book Gallery Ltd. Co., Taipei City.

Zhang, H. (2005), Share price performance following share repurchase. *Journal of Banking & Finance*, 29, 1887-1901.

ACKNOWLEDGEMENT

We are indebted to two anonymous referees for sowing the seeds for this research in many valued feedbacks and insightful comments. We also appreciate Professor Mercedes Jalbert (the editor) for numerous helpful suggestions.

BIOGRAPHY

Mrs. Li-Hua Lin is a lecturer of Department of Information Management, Transworld Institute of Technology, Taiwan. She can be contacted at: 1221, Jen-Nang Rd., Chia-Tong Li, Douliou, Yunlin, Taiwan R.O.C. Email: llh@tit.edu.tw

Mr. Szu-Hsien Lin is a lecturer of Department of Finance, Transworld Institute of Technology, Taiwan, and Ph.D Student of Department of Business Administration at National Chung Cheng University, Taiwan. He can be contacted at: 1221, Jen-Nang Rd., Chia-Tong Li, Douliou, Yunlin, Taiwan R.O.C. Email: aleclin.tw@gmail.com

Dr. Ya-Chiu Angela Liu is a Professor of Department of Business administration, National Chung Cheng University, Taiwan. She can be contacted at: 168 University Road, MinHsiung, ChiaYi, Taiwan R.O.C. Email: finycl@ccu.edu.tw

DETERMINANTS OF IPO UNDERPRICING: EVIDENCE FROM TUNISIA

Sarra Ben Slama Zouari, Unité de recherche DEFI –ESSEC de Tunis
Abdelkader Boudriga, Unité de recherche DEFI –ESSEC de Tunis
Neila Boulila Taktak, Unité de recherche DEFI –ESSEC de Tunis

ABSTRACT

This paper empirically analyzes the short run performance of Tunisian initial public offerings (IPO). It sheds light on the determinants of IPO's in a context of a frontier market characterized by high information asymmetry, low information efficiency, thin trading and the presence of "noise" traders. Using a sample of 34 Tunisian IPO's from the period 1992-2008, we find an average market adjusted initial return for the first three trading days of about 17.8 percent. The factors significantly related to the underpricing are retained capital, underwriter's price support, oversubscription, listing delay and the offer price. Age of the firm, its size and the size of the offer do not seem to reduce the amount of money left on the table by issuers. It appears also that underpricing is driven by irrational investors (ipoers) seeking for short-run capital gains. These results remain unchanged after controlling for the presence of institutional investors, price discount and the existence of liquidity contract. Overall, the results show that investors rely mainly on side information to value IPOs.

JEL: G14; G3

KEYWORDS: Initial public offerings, Short-run underpricing, Underwriter's price support.

INTRODUCTION

Several empirical studies documented the existence of the initial underpricing phenomenon for newly listed firms during the early days of trading across many countries and capital markets. Early studies examined the performance of IPOs on the US market. Ibbotson (1975) find an average abnormal return of 11.4%. Loughran and Ritter (1995) based on their survey of papers on the IPO underpricing report average initial returns of 10.0%. More recently, Purnanandam and Swaminathan (2004) find returns ranging from 14.0 to 50.0% depending on the matching criteria used. At the international level, most researchers have found mixed results compared to American findings. On the German market, Ljungqvist (1997) using a sample of 189 firms over the period 1970-1993 find an initial underpricing of about 10.9%. In France, Jacquillat and MacDonald (1974) and Dubois (1989) report an initial underpricing respectively about 4.2% and 19.0 percent.

In the context of emerging markets, several studies highlighted that Chinese IPO's enjoy the world's highest initial returns. Among others, Mok and Hui (1998), Tian (2003) Chan *et al*. (2004) and Larry *et al*. (2008) report underpricing ranging between 100-300%. These levels are much higher than the average level of 60% in other emerging markets (Jenkinson and Ljungqvist, 2001). For example, Yong and Isa (2003) report an average initial yield of 80.3% for Malaysian IPOs over the period 1980-1991. More recently, Agarwal *et al*. (2008) find an average initial return of 20.8% for Hong Kong. Finally, Kiymaz (2000) documents an average 13.6% underpricing over the period 1990-1995 for a sample of Turkish IPO's.

This paper extends the international literature on IPO's by examining the IPO's on the Tunis Stock Exchange (TSE), a frontier market characterized by high information asymmetry, low information efficiency, thin trading and the presence of "noise" traders. This study thus sheds light on the determinants of IPO's in an insufficiently investigated context. In fact, a limited number of studies have examined IPO's underpricing on the context of frontier market. Particularly, on the TSE most of the conducted studies have highlighted the phenomenon without explaining it. For instance, Ben Naceur and Ghanem (2001) find an average underpricing of 27.8 percent for issues conducted over the period between 1990 and 1999. Gana and Ammari (2008) studied the incidence of shares transfers by the original shareholders on the degree of the initial underpricing. Using a sample of Tunisian candidates companies over the 1992-2006 periods, they find an initial underpricing of about 19.2%, which mainly depends on the original and controlling shareholders.

In this paper, we study the main determinants of initial IPO's performance based on a sample of 34 IPO's listed on the Tunisian Stock Exchange (TSE) over the period 1992-2008. We find an average initial return of about 16.0, 16.8 and 17.8% respectively for the first, second and third day of trading. The retained capital, underwriter's price support, oversubscription, listing delay and the offer price are the factors related to the underpricing. Age of the firm, its size and the size of the offer do not seem to reduce the amount of money left on the table by issuers. The results of the regression remain unchanged after controlling for the presence of institutional investors, the level of price discount and the existence of liquidity contract.

The remainder of the paper is organized as follows. Section 2 briefly discusses the relevant literature. Section 3 provides a brief description of Tunisian equity market. In section 4, we describe data selection, research method and empirical models. Section 5 presents the analysis and interpretations of the empirical results and Section 6 concludes the paper.

LITERATURE REVIEW

A number of theories and explanations of IPO underpricing have been put forward and tested against the data of various stock markets. However, no single theory can explain the initial performance of newly listed firms during the first days of trading (Jenkinson and Ljungqvist, 2001; Ritter and Welch, 2002).

Some models exploit the information asymmetry hypotheses. In this case underpricing is used as a mean to reduce the informational gap between different parties involved in the IPO process (Rock, 1986; Allen and Faulhaber, 1989; Grinblatt and Hwang, 1989 and Welch 1989). They base their explanation on the Winner's Curse Hypothesis; that is underpricing intends to reward the informed investors for revealing private information. Other models based on the "ex ante uncertainty" hypothesis suggest that the uncertainty surrounding the IPO outcomes around listing can induce an IPO's underpricing (Beatty and Ritter, 1986; Carter and Manaster, 1990 and Megginson and Weiss, 1991). According to Beatty and Ritter (1986), underwriters possess a certification role, which reduces uncertainty in the IPO. Carter and Manaster (1990) find that prestigious underwriters underpriced less because they issue firms with lower ex ante uncertainty.

Finally, signalling models suggest that good firms use the underpricing to signal their quality to raise funds in the future with more favourable conditions through seasoned equity offerings (Allen and Faulhaber, 1989; Grinblatt and Hwang, 1989 and Brennan and Franks, 1997). In fact, only good firms can withstand a significant initial loss because they rely on a return on their investment.

To study the determinants of short-run underpricing in the TSE, we examine various explanations proposed by previous research. The variables examined include the retained capital, underwriter price support, oversubscription rate, listing time, offer price, age of the issuing firm, size of the issuing firms and size of the issue.

Retained capital: Many authors (Downes and Heinkel, 1982; Allen and Faulhaber, 1989) have highlighted the association between the level of the capital retained by insiders and the firm value. From an agency theory view, a high level of retained capital serves to align the interest of firm owners (managers) with those of new shareholders. This will lead to a higher value of the firm (Jensen and Meckling, 1976). Furthermore, firms with a diffuse capital structure observe more earnings management than more concentrated firms, which reduces the cash flows and consequently the firm value (Ritter, 1984).

On the other hand, the more the owners/executives are confident on the future perspectives of the IPO firm the more they will retain a high proportion of capital. Thus, the level of retained capital by existing owners will send a signal to the potential investors about the true value of the firm. This will contribute to lower the underpricing, as the company is able to set higher price for the offer (Mroczkowski and Tanewski, 2004).Conversely, high levels of retained capital may be associated with higher risks of cash flow minority rights expropriation (Bozzolan and Ipino, 2007). In such circumstances, potential investors will buy shares only when they are severely underpriced.

Underwriter price support: Early studies document a negative relation between underwriter reputation and initial underperformance of IPO (Beatty and Ritter, 1986; Johnson and Miller, 1988). Works that are more recent also confirm this view (Booth and Chua, 1996; Johnson and Miller, 1988; Kim and Ritter, 1999; Chang and al, 2008). This reflects that prestigious underwriters will reduce agency costs experienced by firms around IPO. On the other hand, firms with favourable information tend to choose high quality underwriters to signal the quality of the new issue (Titman and Trueman, 1986). Others attribute this negative relation to the certification role played by reputable underwriters. In fact, they contribute to reduce information asymmetry between owners and potential investors.

However, underwriter's reputation might be associated with high level of underpricing. In fact, underwriters are likely to care more about the perceived reputation among potential investors with whom they may maintain ongoing relations. Especially with "speculative investors", which seek to realize quick and short-term benefits (Spiess and Pettway; 1997). On the other hand, as noted by Loughran and Ritter (2002), reputable underwriters, which face increased financial analyst coverage of IPO's, are obliged to severely underprice.

In this study, we do not test the impact of reputation because of the lack of information and to the relative short experience of most of underwriters, which prevented us from adequately assess their prestige. However, in the TSE evidence of price support by underwriters are widely reported by both professionals and investors. As noted by several authors, underwriters may be motivated to support share prices after the firm going public to preserve their own reputation. They thus have incentives to support IPO's with low performance (less than the average) after listing (Schultz and Zaman, 1994). Empirically, evidence of price support is documented by Ruud (1993), Hanley (1993) and Schultz and Zaman (1994) on the NYSE and by Xu and Wu (2002) on the Shangai Stock Exchange.

Oversubscription rate: Theoretically, the demand for the IPO, proxied by the oversubscription ratio, positively affects the level of underpripcing. Michaely and Shaw (1994) argue that underpricing depends on the information heterogeneity among investors. Based on the Rock's 'winner curse' model (1986), they show that the decrease of information homogeneity induces higher underpricing. They assume that the level of heterogeneity increases with the demand for the firm's shares, as both informed and uninformed will bid in "good" IPO's, whereas "bad issues" attract only uninformed investors. Alternatively, Chowdhry and Sherman (1996) argue that potentially highly underpriced IPO's may attract more investors looking for high potential capital gains. They explain that when the disclosure of the price is before the end of biddings, it is likely that a substantial information leakage take place. This leads to an increase in the demand for the firm's shares, particularly when investors realize that the offer price is low.

Empirically, several authors used the oversubscription rate to explain the magnitude of abnormal returns of IPO's observant during the first listing day (Allen and Faulhaber, 1989; Chowdhry and Sherman, 1994; Booth and Chua, 1996). Hanley (1993) find a positive relation between the subscription ratio and the size of the initial performance on a sample of American IPO's. Kandel *et al*. (1999) find similar results on the Tel Aviv Stock Market. Agarwal *et al*. (2008) analyze a sample of IPO's on the Hong Kong Stock Market and find a positive relation on the short run but a negative association on a longer horizon. They explain these results by investor's overreaction on the short run.

Listing time: According to Chowdhry and Sherman (1996), the listing delay (the period separating the closing of the offer and the first trading day) is associated with the underpricing level. On one hand, longer time of listing is associated with more uncertainty on the offer. On the other hand, before listing, there are no share price signals. Thus, to compensate investors for the high level of illiquidity firms apply a share-pricing discounts. When, the listing of a firm takes too long, the market may revise its expectations about the future value of the firm and hence affect the subsequent level of underpricing. Mok and Hui (1998) and Su and Fleischer (1999) find a positive relation between average initial returns of IPO's and the listing time for the Shangai Stock Exchange. Megginson and Tian (2006) find that one day's delay of the flotation increases the initial returns by 0.4 percent in China. They attribute this to the unusual long delays of listings in China (over 10 months).

Referring to the specific case of the Tunisian Stock Exchange, the relation between listing delay and underpricing is more likely to be unintended, as there is no ex post information about how long the listing of an IPO will take. This long delay between the closing of the offer and the listing is mainly due to the type of offerings (direct registration, minimum price, firm price, open price) and to regulatory clearances and controls. In such circumstances, investors are discouraged to trade actively in the market as the delay of listing gets longer. This will reduce their irrationality and hence the aftermarket performance of the IPO. Uddin (2008) first highlights this argument. He advocates that to the extent that the issuers do not know the listing delay, it seems hard to believe that they will intentionally lower the offer price. A part of the underperformance is thus unintended by the issuer.

Offer price: The initial price of an IPO offering may also indicate the extent of underpricing, although its level has little economic significance (Fernando *et al*., 1999). Firms do not set the offer price in an arbitrary way. In fact, when the aim of the IPO is to encourage retail investors to participate to the subscription, the issuers set a relatively low price to encourage potential small investors. This will systematically lead to an excessive demand for the security and hence to larger underpricing. Besides, Daily *et al*. (2003) suggest that higher offer prices are associated with lower uncertainty regarding the future performance of the firm.

Conversely, firms looking to attract institutional investors tend to set high offer prices. In fact, institutional are known to avoid low price shares (Gompers and Metrick, 1998). This presence of institutionals might lead to higher underpricing, given the necessary compensation for the valuable information they provide and their contribution to a better marketing of the IPO (Benveniste and Spindt, 1989). Furthermore, Jain and Kini (1999) argue that a low offer price may indicate little demand, low value or both and hence are associated with lower short-term performance.

Empirical evidence provides mitigated results regarding the relation between the offer price and underpricing. Ibbotson *et al*. (1988) find that firms offered with very low prices usually record high levels of underpricing. They argue that low priced-offers present higher risks and are subject to speculative trading. Fernando *et al*. (1999) report a U-shaped association.

Age of the issuing firm: Age of the firm is hypothesized to have a negative impact on the level of underpricing following the IPO (Carter *et al*. 1998; Ritter, 1984, 1991, and Megginson and Weiss, 1991).

First, newly created firms, as opposed to old ones, exhibit higher ex-ante uncertainty. Since, less-seasoned firms are less likely to have been followed by financial analysts (and so well assessed) as they do not have enough historical published financial data. Second, the availability of information on firms operating for several years contributes to reduce the information asymmetry around the IPO (Ritter, 1984 an 1991; Hensler *et al*., 1997). This uncertainty about the future perspectives of the candidate company induces a higher underpricing (Bilson *et al*., 2003).

Size of the issuing firms: Several studies have reported a negative link between firm size and short run underpricing (Megginson and Weiss, 1991, Ibbotson *et al*., 1994; Carter *et al*., 1998). Larger firms with more diversified products lines and monitoring proceedings, have better access to investment capital and resources, which are crucial for their profitability and survival (Finkle, 1998). Indeed, the size of the firm is usually negatively associated to its risk. These factors contribute to reduce the uncertainty around the IPO of large firms for potential investors (Kiymaz, 2000; Bhabra and Pettway, 2003).
However, other studies (Titman and Wessels, 1988; Schultz, 1993) support the inverse relation between risk and firm size.

Size of the issue: The size of the IPO offer, measured by the total gross proceeds raised from the market, is expected to affect negatively the underpricing level. According to Miller and Reilly (1987) and Clarkson and Simunic (1994), the size of the offering indicates the uncertainty about IPO firms. Well-known firms with running years and better records usually offer larger IPO's. This contributes to reduce the perceived risk of the IPO from the side of potential investors (Carter *et al*., 1998; Jain and Kini, 2000). Carter and Manaster (1990) document that, besides the uncertainty surrounding the IPO, investors will take into account its size to assess IPO performance. Empirically, several studies report evidence for this negative relation between the amount of raised funds and the level underpricing (Ritter, 1987, Jog and Riding, 1987, Chalk and Peavy, 1990 and Clarkson and Merkley, 1994).

THE IPO MARKET IN TUNISIA

The Tunis Stock Exchange (TSE) was established in 1969. During the first three decades, the Tunis stock market has not played a significant role in funding private companies. Since then, Tunisian authorities has undertaken several reforms mainly during the 1990s aimed at developing the market financing of the economy. The current electronic trading system used by the TSE was established in 1996 (AtosEuronext upgraded to a new version in 2007). All listed securities are traded on the system. The most liquid shares are traded continuously and the less liquid are traded in fixing mode.

Listing on the main market requires a company to float freely at least 10% of its outstanding shares to the public with a minimum of 200 shareholders. The listed firm must have at least two years of profit and one dividend paid. Three recognised methods for IPO's in Tunisia. We find the ordinary procedure for listing of already existing shares and offers for sale and beading procedure for new public issues.

The approval process is lengthy. First, candidate firms agree on the price of the issue with the underwriter. Then, an application for approval is submitted to the Tunisian Financial Market Council (FMC). The FMC evaluates the company, examines its forecast profits and the quality of its internal controls and its information disclosure. Once the FMC have approved the application, the issuer, the underwriter and an independent auditor fill in a prospectus. The prospectus must include detailed financial accounting information about the firm, along with details on the company's operating history, management team, prospects, risks, its controlling shareholders and its subsidiaries. The underwriter (pricer) sets the final share issue price and announces it to the public.

In Tunisia, a quotas procedure is used to allocate IPO shares. Issuing firms and underwriters distribute shares randomly and equally across application orders collected in the subscription period. However, in recent years shares are often classified into different categories: institutional investors, foreign investors and local subscribers. Each category is allocated a pre-specified percentage of the issued shares to ensure a better diffusion of the shares among various categories of shareholders and hence to reduce underpricing and speculation.

As in most emerging markets, the TSE has imposed ceilings since 1994. The purpose of this rule is to protect the stock market and investors from speculative threats often observed in emerging marktes. It aimed also at avoiding price irregularities and volatility. All the stocks have undergone these regulatory limits from their first day of trading. The listed stock prices can fluctuate between ± 3.0%. When a stock price reaches the ceiling, the share trading is suspended until the stock price falls below the maximum fluctuation rate, or rises above the minimum rate of change during the same day. However, we have noted varying levels of the margins of fluctuations in the TSE over the period of study, particularly during the first days of trading. Sometimes the supervisory board has removed the ceilings during the first three days of new firm listing. In other circumstances, the fluctuation margins were increased to ± 18.0%. These changes aimed at allowing the market to evaluate freely the price of the newly introduced shares.

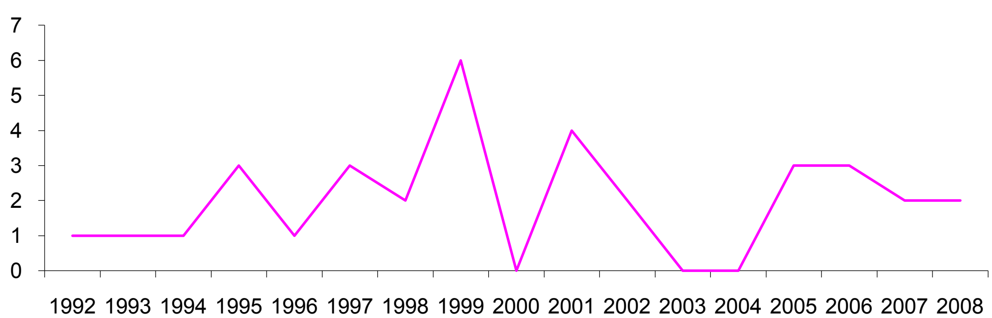
Table 1 Number of Listed Companies 1990-2008

	1990	**1995**	**1999**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Number of listed companies	13	26	44	46	45	44	45	48	51	52
Capitalisation in million dinars	448	3967	3326	2842	2976	3085	3840	5491	6527	6063

This Table exhibits the number and the market capitalisation of listed companies in Tunisia from 1990 to 2008. Over the period 1990-2006, the Tunisian Dinar (TND) has ranged from 1 USD to 0.8 USD.
Source: TSE and BVMT annual reports

Table 1 shows that the number of listed firms increased from 13 firms (mostly from the financial sector) in 1990 to 52 firms in 2008. Following the privatization program launched by the Tunisian government during the 1990s, going public was used as a mean for the privatization of state owned enterprises.
The number of IPOs varied sharply across the period 1992-2008 (Figure 1). The year 1999 recorded the highest number of listings, with six newly public offerings. This coincided with the privatization of four state owned companies following the commitment of the Tunisian government to move toward a market-based economy. The years 2000, 2003 and 2004, with no IPOs, exhibited the lowest figures. For the year 2000, this may be due to the large number of IPO's conducted in 1999. However, for the years 2003 and 2004 we attribute this absence to unfavorable market conditions (crisis of confidence and of liquidity).

Figure 1: Number of Listing by Year (1992—2008)



METHODOLOGY

Data

The sample consists of 34 new listings of ordinary shares on the Tunisian stock exchange from January 1992 to December 2008. We considered only IPOs motivated by opening capital decisions and we excluded IPO's with no selling of shares. Post-IPO performance data on the closing prices and the market Index are collected from the TSE online database (www.bvmt.com.tn). Only one firm, a retail company, was delisted because their bankruptcy in 2002. This does not alter our analysis given that the first listing of this company was in 1997, five years before delisting. We collected data used to explain short run underpricing from two sources: the FMC and the TSE. We obtained information on IPO firm characteristics around the listing period and on the operation of introduction itself from hard copies of prospectus published by the issuers (available at the FMC documentary service and from the *Bulletin Official* of the TSE).

Research Design

To analyze the relation between initial returns of IPOs and their determinants, we use a two-steps approach. First, we measure the short run underpricing and then, we investigate the factors affecting the initial returns. Consistent with previous studies (Aggarwal *et al*., 1993; Chi and Padget, 2005), we use the following methodology to measure the underpricing of IPO's. We calculated the return of stock *i* at the end of the first trading day as following:

$$R_{i1} = \frac{P_{i1}}{S_{i0}} - 1 \tag{1}$$

Where P_{i1} is the closing price of the stock *i* on the first trading day, and S_{i0} is the subscription price and R_{i0} is the raw first-day return on the stock price. As the issue price of the share is fixed at the prospectus publication date, the return between the price at the end of the first day of trading and the issue price will depend, in part, on changes in market conditions facing companies. To account for the impact of the substantial delay between pricing and listing, we use the market-adjusted abnormal return for each IPO on the first trading day computed as:

$$MAR_{m1} = R_{i1} - R_{m1} \tag{2}$$

The return on the market index for the same day is given by:

$$R_{m1} = \frac{P_{m1}}{P_{m0}} - 1 \tag{3}$$

Where P_{m1} is the closing market index value on the first trading day, P_{m0} is the closing market index value on the last day of the subscription period of the IPO, and R_{m0} is the first day's comparable market return. In this study, we use the TUNIDEX index (the market capitalization weighted index for the TSE) as a proxy for the market index. As expressed in (2), the market adjusted abnormal return MAR_{m1} supposes that the systematic risk of the IPO's is equal to one. A number of studies (Ibbotson, 1975; Spiess and Affleck-Graves, 1995) demonstrate that the average beta of newly listed firms is higher than the systematic risk of the market portfolio. Thus, this measure of the abnormal return provides a somehow upwardly biased estimate of the initial performance of the IPO relative to the market.

To account for the ceiling imposed on trading at the TSE, several short-run returns are computed to capture the effective underpricing MAR_{mt} (t= 2, 3) in an analogous manner to MAR_{m1}. We calculate also the underpricing for the days four to 10 after listing. We note that beyond the 3rd day of listing, underpricing remains relatively flat and stable. Hence, in the remaining of this work, we limit the analysis to the first three days after listing. As noted by Ljungqvist *et al*. (2006), it is appropriate to measure the underpricing over a longer window in less developed markets where aftermarket prices may take more time to reach equilibrium. To explore the determinants of IPO underpricing, we use multiple linear regression models. In Table 2, we summarized all explanatory variables used in our study.

Table 2: List of Explanatory Variables

Variables	Proxies	Measure	Expected sign
Retained Capital	**Capret**	1-percentage of shares raised to total outstanding shares	+/-
Underwriter's price support	**UndPS**	Dummy variable, it takes one if the underwriter supports its own IPO and 0 otherwise.	+/-
Oversubscription ratio	**Over**	The number of demanded shares over the number of shares offered	+
Listing delay	**Del**	The number of days separating the closing of subscriptions and the first day of trading	+
Offer price	**Price**	The natural logarithm of the price set by the issuer	-
Firm age	**Age**	The natural logarithm of the number of years between the year of creation and the IPO	-
Firm size	**FSize**	The natural logarithm of total assets at the end of the year preceding the IPO of the issuing firm	-
Offer size	**OSize**	The natural logarithm of the number of offered shares * offer price	-

The regression model retained is as follow:

$$\begin{aligned} MAR_{mt} &= \beta_{\grave{a}} + \beta_1 Capret + \beta_2 UndPS + \beta_3 Over + \beta_4 LDel + \beta_5 L\,\mathrm{Pr}\,ice + \\ &\beta_6 LAge + \beta_7 FSize + \beta_8 OSize + Conbtrol\ \ Variables + \varepsilon \end{aligned} \quad (4)$$

Where MAR_{mt} is the degree of short run underpricing for t =1, 2 and 3 (market adjusted initial returns of IPO of the three first days). Capret is the percentage of retained capital. UndPS, a dummy variable which takes one if the underwriter supports its own IPO and zero otherwise. Over is the oversubscription ratio measured by the number of demanded shares over the number of offered shares. LDel is the listing time calculated as the natural logarithm of the number of days separating the closing of subscriptions and the first day of trading. LPrice calculated as the natural logarithm of the offer price by the issuer. LAge is the issuing firm age, measured as the natural logarithm of the number of years between the year of creation and the IPO. FSize is the firm issuing size measured by the natural logarithm of total assets of the issuing firm at the end of the year preceding the IPO. OSize represents the funds raised measured by the natural logarithm of the number of offered shares multiplied by the offer price.

We introduce three control variables. Cliq is a dummy variable taking one if there is a liquidity contract in the IPO and zero otherwise. Inst is a dummy variable taking one if a part of the IPO is reserved to institutional investors and zero otherwise. Finally, Disprice is the level of price discount set by the issuer based on the mean of the firm value obtained using several methods of valuation.

EMPIRICAL RESULTS

Characteristics of Short Run Underpricing

Table 3 reports summary descriptive statistics of underpricing for the 34 IPO's conducted during the period 1992-2008. The degree of underpricing ranges from -4.4% to +65.0%. The average initial return amounted 16.0%, 16.8% and 17.8% for the first, the second and the third trading day, respectively. This underpricing is significantly different from zero at the 1% level for all cases. The percentiles exhibit the same patterns for MAR1, MAR2 and MAR3, confirming the significance of the underpricing. On the other hand, the median in all cases is lower than the mean, which indicates the skewness of the initial returns series is at the right. Our results are closed to Gana and Ammari (2008), who reported initial underpricing of about 19.2% for the sample of Tunisian IPOs listed from 1992 to 2006. Yet, these results contrast with those found by earlier studies examining short run underpricing of IPO's of the TSE. For instance, Ben Naceur and Ghanem (2001) reported a short run underpricing of 27.8% over a longer period from 1990 to 1999.

Table 3: Descriptive Statistics of MAR of the 1st, 2nd and 3d Day (1992-2008)

	Min	**Max**	**Mean**	**Median**	**SD**
MAR 1	-0.044	0.640	0.160	0.108	0.172
MAR 2	-0.048	0.607	0.168	0.110	0.168
MAR 3	-0.033	0.650	0.178	0.113	0.181
Percentiles	**10%**	**25%**	**50%**	**75%**	**90%**
MAR 1	0.0024	0.0296	0.1087	0.2484	0.3909
MAR 2	0.0024	0.0297	0.1087	0.2484	0.3909
MAR 3	0.0048	0.0439	0.1137	0.2819	0.5012

This table reports summary descriptive statistics (minimum, maximum, mean, median, standard deviation and percentiles) of the market adjusted abnormal return (MAR) of the first, second and third day for each year, respectively.

Table 4 shows that the IPO's of the year 2005 displays the highest underpricing (32.2%) while we have recorded the lowest figure in 1993 (0.2%). The analysis of these results suggests the existence of two sub-periods. The first one includes the years 1992-1998 and 2002, which exhibit low levels of underpricing. For the 1992-1998 period, we can attribute this weak underpricing to the fact that the stock market was not well developed and juvenile. While, the impact of the year 2001 (due especially to geopolitical tensions) can explain the poor short-term performance of IPO's in 2002. The second sub-period includes the years 1999, 2001 and the period 2005-2008 with higher levels of underpricing. We attribute this to the outstanding performance of the Tunisian economy and to the growing interest of international investors to the TSE since 2005.

We also compare the frequencies of the firms exhibiting underperformance (positive abnormal returns) and those with negative abnormal returns. It appears that for the first day of trading, 91.2% of the 34 issuing firms were underpriced. For the second and the third day, only 5.9% recorded negative returns.

Descriptive Statistics of Independent Variables

Table 5 reports the characteristics of the main variables used in this study. The retained capital for the 34 offered shares averages 76.1%, with a minimum of 51.0% and a maximum of 90.0%. Oversubscription averages 4.5 for our sample, with a minimum of 0.6 and a maximum of 18.6. These levels are comparable to oversubscription rates observed in other developed and emerging markets. In our sample of 34 IPO's, the listing of a firm takes in average 18 days. However, the listing delay varies across IPO's ranging from a minimum of four days to a maximum of 56 days.

Table 4: Summary of MAR Characteristics by Introduction Year

Year	MAR 1	MAR 2	MAR 3
1992	0.054	0.082	0.109
1993	0.002	0.004	0.006
1994	0.030	0.049	0.078
1995	0.029	0.047	0.056
1996	0.009	0.009	0.008
1997	0.041	0.043	0.047
1998	0.084	0.103	0.11
1999	0.239	0.2411	0.268
2000	-	-	-
2001	0.227	0.261	0.312
2002	0.038	0.036	0.041
2003	-	-	-
2004	-	-	-
2005	0.322	0.300	0.291
2006	0.196	0.194	0.165
2007	0.305	0.291	0.305
2008	0.197	0.231	0.197
Total	**0.1607**	**0.1683**	**0.1783**

This table shows average short-run underpricing (MAR) by introduction year. The level of MAR is reported over the first three days of listing. Source: authors' calculations.

The average price for Tunisian IPO's is 15.75 dinars, the minimum offer price is 2.55 dinars and the highest price was set to 43 dinars. Professionals consider a price less than five dinars as a low price, whereas they consider a share offered above 20 dinars as a high price. The average and the median age of firms, which conducted IPO's in the TSE, are about 22 years. The minimum number of years of operation is one year and the maximum is 67 years. It seems also that in recent years, the IPO market attracted well-established firms with long experience and mature organisations. The average total assets is 27.9 million dinars, with a minimum of 0.98 and a maximum of 80.9. Medium size companies dominate our sample (half of IPO firms with less than 30 million dinars of total assets). The total funds raised by firms listed in the TSE averaged 8.7 million dinars. The minimum gross proceeds amounted 0.75 and the highest capital raised 43.6 millions. This relatively small amount of funds raised, compared to other international emerging markets, is explained first by the low capitalisation level of IPO candidate companies. Second, Tunisian companies are historically bank oriented and they are not enthusiastic about raising funds from the market. However, during the last years gross proceeds from IPO's reached higher levels with more than 43 million dinars raised from the market for each of the two IPO's conducted during the year 2008.

Table 5: Summary of IPO Sample Characteristics

	Mean	Median	Min.	Max.	S.D.
Capret	0,76	0,73	0,51	0,90	0,10
Over	4,52	3,50	0,61	18,61	4,30
LDel	18,38	17,00	4,00	56,00	10,51
LPrice	15,75	15,00	2,55	43,00	8,95
LAge	21,94	21,50	1,00	67,00	15,58
FSize*	65 ,3	27,9	0,98	80,9	141,2
OSize*	8,7	5,5	0,75	43,6	10,2

Table 5 reports the main descriptive statistics of the variables used as determinants of short run underpricing in Tunisia. Capret is the retained capital. Over is the oversubscription ratio, measured by the number of demanded shares over the number of offered shares. LDel, the listing time calculated as the natural logarithm of number of days separating the closing of subscriptions and the first day of trading. LPrice calculated as the natural logarithm of the offer price by the issuer. LAge is the issuing firm age, we measured it as the natural logarithm of the number of years between the year of creation and the IPO. FSize is the firm issuing size measured by the total assets at the end of the year preceding the IPO of the issuing firm. OSize is the funds raised measured by the number of offered shares x offer price.
** In millions of dinars (approximately 1 TND = 0.85 D)*

In Table 6, we present the correlation matrix of the variables used. Parametric and nonparametric correlation matrix show no correlation between the different explanatory variables.

Table 6: Parametric and Non Parametric Correlation Matrix

	Capret	Over	lDel	lPrice	lAge	FSize	OSize
Capret	**1.00**	0.20	-0.01	-0.06	-0.19	0.21	-0.09
Over	0.22	**1.00**	0.10	-0.23	0.16	0.27	0.26
LDel	-0.09	0.21	**1.00**	0.23	0.06	-0.15	0.09
LPrice	-0.05	-0.37*	0.33	**1.00**	0.18	-0.17	-0.09
LAge	-0.08	-0.02	0.04	0.20	**1.00**	0.06	0.31*
FSize	0.24	-0.01	-0.26	-0.06	-0.08	**1.00**	0.23
OSize	-0.12	0.10	0.03	-0.03	0.28	0.27	**1.00**

Table 6 shows the parametric test of Pearson (lower part) and nonparametric test of Spearman (upper part) correlation between different explanatory variables used in the study.Capret is the retained capital. Over is the oversubscription ratio, measured by the number of demanded shares over the number of offered shares. LDel the listing time calculated as the natural logarithm of number of days separating the closing of subscriptions and the first day of trading. LPrice calculated as the natural logarithm of the offer price by the issuer. LAge is the issuing firm age, we measured it as the natural logarithm of the number of years between the year of creation and the IPO. FSize is the firm issuing size measured by the total assets at the end of the year preceding the IPO of the issuing firm. OSize is the funds raised measured by the number of offered shares x offer price., **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.*

Findings and Discussion

We regress the initial returns measures on all explanatory variables supposed to influence the IPO underpricing. The regression models use the market adjusted returns for the three first days of trading (MAR_{mt}) of all 34 IPO's. Table 7 presents the results of coefficient estimates. As noted above, we consider only the first three days of trading as the underpricing remains relatively flat and stable beyond the third trading day. For the different MARs the estimated coefficient are comparable in size, magnitude and significance. We therefore focus in the remainder of the paper only on MAR3.

Table 7: Determinants of Short-run Underpricing

	(1) MAR1		(2) MAR2		(3) MAR3	
Capret	-0.393	(0.0169)**	-0.371	(0.0196)**	-0.408	(0.0183)**
UndPS	0.223	(0.0001)***	0.218	(0.0001)***	0.206	(0.0010)***
Over	0.004	(0.1859)	0.007	(0.0367)**	0.008	(0.0426)**
LDel	0.102	(0.0062)***	0.095	(0.0126)**	0.128	(0.0143)**
LPrice	-0.086	(0.0138)**	-0.075	(0.0300)**	-0.081	(0.0247)**
LAge	-0.021	(0.4222)	-0.029	(0.2562)	-0.030	(0.2393)
FSize	-0.006	(0.6240)	-0.009	(0.4623)	-0.012	(0.4024)
OSize	-0.011	(0.5068)	-0.008	(0.6407)	-0.023	(0.2575)
cons	0.671	(0.0814)	0.659	(0.0834)	0.911	(0.0402)
N	34		34		34	
R^2	0.7050		0.7074		0.6760	

Table 7 presents regression results of our model. MAR_{mt} *is market adjusted initial returns of IPO for t=1, 2 and 3 .It measures the degree of short run underpricing over the three first days. Capret is the retained capital. UndPS, dummy variable, it takes one if the underwriter supports its own IPO and zero otherwise. Over is the oversubscription ratio, we measured it by the number of demanded shares over the number of offered shares. LDel is the listing time calculated as the natural logarithm of number of days separating the closing of subscriptions and the first day of trading. LPrice calculated as the natural logarithm of the offer price by the issuer. LAge is the issuing firm age, we measured it as the natural logarithm of the number of years between the year of creation and the IPO. FSize is the firm issuing size measured by the total assets at the end of the year preceding the IPO of the issuing firm. OSize is the funds raised measured by the number of offered shares x offer price.*
, **, and * denote statistical significance at the 10%, 5%, and 1% level, respectively.*

The regression results show that retained capital (Capret), underwriter price support (UndPS), listing delay (lDel) and offer price (lPrice) are statistically significant and have the expected signs. The estimated coefficient for the variable oversubscription rate is positive and statistically significant. The other explanatory variables (firm age, firm size and the size of the issue) do not seem to have any impact on the level of underpricing.

Underpricing is negatively correlated with the share of capital held by the controlling shareholders (Capret).This result is consistent with both the "agency costs" and the "signalling hypothesis". However, we privilege the signalling hypothesis channel. In fact, both a high level of informational asymmetry and a lack of transparency characterize the Tunisian exchange market. In such circumstances investors lean mainly on side signals to assess the true value of the firm. Retaining capital by original owners is thus a strong indicator of the future perspectives of the IPO firms. On the other hand, investors often consider the fact to diffuse a high proportion of capital among small minority shareholders as a mean to share risks (in the future) or to disengage progressively from the firm.

Our results show also a strong evidence for underwriters' price support. The coefficient estimate of the variable (UndPS) is significantly positive at the 1% level. This result is consistent with the findings of Schultz and Zaman (1994) on the NYSE, Xu and Wu (2002) on the Shangai stock exchange and Uddin (2008) on the Indian stock exchange. The result confirms the widespread view among professionals on the existence of price support practices on the TSE. We believe that some brokers use price support practices for mainly two reasons. First, their "reputation" on the market as leading successful IPO's can motivate them to practice "price support." Second, because of the thinness of the Tunisian exchange market, underwriters, which act also as brokers gain money from trading activities on the post-IPO market. They thus have incentives to support their own IPOs to maximize their potential profit from other investors trading.

The demand for the firm's shares is positively related to the degree of undepricing. We believe that this positive coefficient estimate of the variable oversubscription indicates the expectations of potential investors on the future short-run performance of the IPO. We argue that the Tunisian market attracts investors that participate in the stock exchange only during IPO said to be "ipoers," motivated only by short run profits. They exploit information leakage made by institutional investors or other "strategic investors" to subscribe to highly underpriced IPO's.

The positive sign of listing delay (lDel) is consistent with the findings by Chowdhry and Sherman (1996) on the UK market and by Megginson and Tian (2006) on the Chinese market. However, we do not advance the same explanation. It is in fact hard to advocate that candidate firm is intendly underpriced when listing delays get longer. We support the point of view, which states that underpricing is more likely to be unintended. In fact, listing delays lead to increased information leakage about the true value of the offered share. Rationed investors looking for short run profits, particularly "ipoers," will thus try to catch up and will add to the buy side pressure on post-IPO trading. This might lead to an overreaction of share prices during the first days of listing.

Our findings show a negative relation between offer price (lPrice) and underpricing. This may be attributed either to higher demand for low price IPO's or to the lower uncertainty surrounding IPO'S offered at high prices. We tend to support the first explanation as price and oversubscription rate are negatively and significantly correlated (-0.37). Besides, subscribers are more likely to be exposed to rationing when the offer price is low. This rationing will add to the pressure on the buy side in the post-IPO trading and will thus lead to an increase in the short run performance of offered shares.

The other explanatory variables included in the regression do not have any impact on the level of underpricing. This indicate that age, firm size and the offer size are not used by investors to assess the information asymmetry and thus to reduce ex ante uncertainty about the issuing firm. Differently put, we document that Tunisian investors rely mainly on side information (retained capital, underwriter, demand level and listing delay) rather than on companies characteristics disclosed on IPO's prospectus. These findings are contradictory to other results on frontier markets. For instance, Gasbarro *et al*. (2003) find that information disclosed in the prospectus, such cash flow and sales, are positively related to the level of initial underpricing on a sample of Mauritius IPOs. We give two explanations to our result. On one hand, we can attribute this to the presence of a high number of " ipoers" who are only interested in short run performance of the share. On the other hand, Tunisian investors seem to be sceptical about the value of information disclosed on IPO's prospectus. In fact, particularly in Tunisia, firms often proceed intensively to window dressing before going public.

Robustness Checks

To investigate the robustness of our results, we control the impact of three variables on underpricing : namely the participation of institutional investors in IPO's, the level of price discount and the existence of liquidity contracts. Results are presented in Table 8. We note that the direction and significance of the coefficient estimates for the basic model remain unchanged. First, the existence of a liquidity contract is unrelated to the level of underpricing. This indicates that providing a protection against market illiquidity does not contribute to reduce ex ante uncertainty and hence to lower the amount of the money left on the table by issuing firms. Second, the presence of institutional investors does not act as a "certification" of the value of the company, which reduces uncertainty and therefore produces a lower level of underpricing. Our results are inconsistent with Ljungqvist *et al*. (2006). Finally, the level price discount set by issuing firms is not associated with the level of underpricing.

Table 8: Robustness Check

	(1) MAR3		**(2) MAR3**		**(3) MAR3**		**(4) MAR3**	
Capret	-0.412	(0.0185)**	-0.407	(0.0179)**	-0.418	(0.0396)**	-0.436	(0.0457)**
UndPS	0.211	(0.0004)***	0.203	(0.0010)***	0.205	(0.0013)***	0.210	(0.0006)***
Over	0.009	(0.0265)**	0.0095	(0.0267)**	0.008	(0.0547)*	0.0098	(0.0408)**
LDel	0.125	(0.0101)**	0.129	(0.0126)**	0.127	(0.0199)**	0.1233	(0.0166)**
LPrice	-0.091	(0.0150)**	-0.086	(0.0226)**	-0.082	(0.0265)**	-0.093	(0.0189)**
LAge	-0.038	(0.1848)	-0.031	(0.2226)	-0.029	(0.2526)	-0.036	(0.2014)
FSize	-0.009	(0.4906)	-0.011	(0.3892)	-0.011	(0.4136)	-0.008	(0.5275)
OSize	-0.020	(0.3219)	-0.015	(0.5161)	-0.024	(0.2807)	-0.023	(0.4127)
Cliq	-0.054	(0.1923)					-0.053	(0.3400)
Inst			-0.038	(0.4744)			-0.006	(0.9188)
Disprice					-0.022	(0.8644)	-0.053	(0.7149)
cons	0.917	(0.0397)	0.802	(0.0910)	0.94	(0.0791)	0.9731	(0.1123)
N	34		34		34		34	
R^2	0.6944		0.6828		0.6762		0.6959	

*Table 8 reports results of four regression models including our three control variables (Cliq, Inst and Disprice). We added respectively Cliq, Inst, Disprice in the first, second and third equations. In the fourth equation, we introduced all our control variables. MAR_3 is the degree of short run underpricing for the third day. Capret is the retained capital. UndPS, dummy variable, it takes one if the underwriter supports its own IPO and zero otherwise. Over is the oversubscription ratio, we measured it by the number of demanded shares over the number of offered shares. LDel is the listing time calculated as the natural logarithm of number of days separating the closing of subscriptions and the first day of trading. LPrice calculated as the natural logarithm of the offer price by the issuer. LAge is the issuing firm age, we measured it as the natural logarithm of the number of years between the year of creation and the IPO. FSize is the firm issuing size measured by the total assets at the end of the year preceding the IPO of the issuing firm. OSize is the funds raised measured by the number of offered shares x offer price. Cliq is a dummy variable taking one if there is a liquidity contract in the IPO and 0 otherwise, Inst is a dummy variable taking one if a quota of IPO is reserved to institutional and 0 otherwise and Disprice is the price discount. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.*

To further investigate the extent of our results, we re-estimate our regressions taking into account the industry affiliation of the firm. Daily *et al*. (2005) and Lee *et al*. (2001) use industry type to distinguish between high- and low-technology firms. Clarckson and Merkley (1994) and Gajewski and Gresse (2006) account for the risk of the industry. They use a dummy variable to differentiate risky industries (with an average beta greater than 1) and less risky industries (with average betas less than 1).

In referring to Tunisian IPOs, it is not possible to test the impact of Hig-tech affiliation on underpricing. Among the 34 issuing firms, no one can be classified into such category. We thus consider two other specific dummy variables. The first variable (IND) takes one if the issuing firm operates in the manufacturing industry and 0 otherwise. These firms have more tangible assets and are easier to assess.

They hence display less ex ante uncertainty. The second variable (Finance*)* takes one for the IPOs made by financial institutions and 0 otherwise. Financial IPOs are expected to have less underpricing compared with other sectors. They are associated with lower uncertainty about future prospects of the company and to a greater transparency in accounting disclosure.

Our results (Table 9) do not exhibit significant difference between financial and non-financial IPOs with regard to their performance after listing. This result is consistent with the findings of Firth (1997). Table 9 indicates that IPO underpricing is less pronounced for firms belonging to the manufacturing sector than for firms operating in non-manufacturing activities. This gives evidence to the hypothesis of a better assessment of enterprises operating in conventional activities. Firms with low proportion of intangible investment to total assets exhibit lesser ex ante uncertainty.

Table 9: Determinants of Underpricing Including Sector Variables

	(1) MAR3		(2) MAR3	
Capret	-0.385	(0.0184)**	-0.360	(0.0426)**
UndPS	0.190	(0.0011)**	0.200	(0.0013)**
Over	0.006	(0.1503)	0.005	(0.2937)
LDel	0.122	(0.0331)**	0.135	(0.0108)**
LPrice	-0.092	(0.0150)**	-0.090	(0.0175)**
Ind	-0.069	(0.0994)**		
Finance			0.040	(0.5564)
cons	0.323	(0.0504)	0.227	(0.1305)
N	34		34	
R^2	0.6625		0.6332	

Table 9 presents more investigation on ex-ante uncertainty by introducing sector variables (Ind, Finance). MAR_3 is the short run underpricing of the third day. Capret is the retained capital. UndPS, dummy variable, it takes one if the underwriter supports its own IPO and zero otherwise. Over is the oversubscription ratio, we measured it by the number of demanded shares over the number of offered shares. LDel is the listing time calculated as the natural logarithm of number of days separating the closing of subscriptions and the first day of trading. LPrice calculated as the natural logarithm of the offer price by the issuer. Ind, is a dummy variable taking one if the IPO was in the Industrial Manufacturing (General Manufacturing, Steel, Metal, Chemical, Pharmaceutical) sector *and zero otherwise, Finance, is a dummy variable taking one (1) if* the IPO was in the financial sector (banking and insurance), otherwise is coded zero (0). **, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.*

CONCLUSION

This paper attempts to analyze the short-run underpricing for a sample of 34 Tunisian IPO's for the period 1992-2008. While accounting for the presence of ceiling constraints, we captured the level underpricing over the first three days of trading. The initial return is about 17.8% for the third day. However, we highlighted varying level underpricing across the years. This underpricing is comparable to other international studies, but is different from those of other emerging markets such as the Chinese and Hong Kong markets.

We test the relation between the degree of underpricing and a set of exogenous variables hypothesized to affect the underpricing. Estimation based on multivariate regression analysis shows that retained capital, oversubscription rate, listing delay and offer price, significantly influence the underpricing level of Tunisian IPO's. We report also that irrational investors (Ipoers) who rely on side information and rumours to subscribe to potentially "good" IPOs dominate the Tunisian IPO market. Besides, our results find a strong evidence of underwriter's price support.

To further explore the extent of our results, we introduced three control variables: the participation of institutional investors to the IPO, the existence of liquidity contracts (two features of the Tunisian market) and the level of price discount. None of these variables plays any role in reducing neither the asymmetry information nor the uncertainty surrounding IPOs.

The results of this study have two policy implications. First, they provide useful information for prospect investors (especially international) who are interested in the Tunisian IPO market. Second, they offer insights to policy makers and regulator to better understand initial returns and thus to reduce adverse impacts of market irregularities and price volatility around listing periods.

This study could be extended in several ways. One might use other proxies for ex ante uncertainty, such as taking into account the high-tech features of the issuer. It is also interesting to investigate short-run performance using alternative measures of market-adjusted returns. Finally, it is worthy to examine the after-market performance of IPOs over longer horizons.

REFERENCES

Aggarwal, R.., R. Leal and L. Hernandez (1993), 'The aftermarket performance of initial public offerings in Latin America', *Financial Management*, (Spring) : 42–53.

Agarwal, S., C. Liu and S.G. Rhee (2008), 'Investor demand for IPO's and aftermarket performance: Evidence from the Hong Kong stock market', *Journal of International Financial Markets, Institutions and Money*, 18 (2): 176-19.

Allen, F. and G. Faulhaber (1989), 'Signaling by underpricing in the IPO market'*, Journal of Financial Economics,* 23: 303-323.

Beatty, R. P. and J. R. Ritter. (1986), 'Investment banking, reputation, and the underpricing of initial public offerings'*, Journal of Financial Economics*, 15(1/2): 213-232.

Benveniste, Lawrence M. and P. A. Spindt (1989), 'How investment bankers determine the offer' *Journal of Financial Economics*, 24 (2): 343-361.

Ben Naceur, S. and H. Ghanem (2001), 'The Short and Long-run Performance of New Listings in Tunisia'*, International Review of Finance*, (4): 235-246.

Ben Naceur, S. and A. Omri (1997), 'Sous-évaluation des Sociétés Introduites sur la Bourse Emergente de Tunis (1991-1995)', *Revue Monde en développement*, (25) : 33-44.

Bhabra, H. S. and R. H. Pettway (2003), 'IPO prospectus information and subsequent performance'*, Financial Review*, (38): 369-397.

Bilson, C., R. Heanry, J. G. Powell and J. Shi (2003), 'The Decision to Voluntary Provide an IPO Prospectus Earnings Forecast: Theoretical Implication and Empirical Evidence', *Working paper*, Australian National University.

Booth, J. and L. Chua (1996), 'Ownership dispersion, costly information and IPO underpricing', *Journal of Financial Economics*, (41): 291−310.

Bozzolan, S. and E. Ipino (2007), 'Information Asymmetries and IPO Underpricing: The Role of Voluntary Disclosure of Forward-Looking Information in the Prospectus', *working paper*.

Brennan M.J. and J. Franks (1997) 'Underpricing, ownership and control in initial public offerings of equity securities in the UK'*, Journal of Financial Economics*, 45 (3) : 391-413.

Carter R., F. Dark and A. Singh (1998), 'Underwriter reputation, initial returns, and the long-run performance of IPO stocks', *The Journal of Finance*, 53: 285-311.

Carter R. and S. Manaster (1990), 'Initial public offerings and underwriter reputation', *Journal of Finance,* 45: 1045-1068.

Chalk A.J. and J.W. Peavy (1987), 'Initial Public Offerings: Daily Returns, Offering Types and the Price Effect'*, Financial Analysts Journal,* 43: 65-69.

Chan K.L., K.J. Wei and J.B. Wang (2004), 'Underpricing and long-term performance of IPO's in China', *Journal of Corporate Finance,* 10: 409-430.

Chang X., A.F. Gygax, E. Oon and H.F. Zhang (2008), 'Audit quality, auditor compensation and initial public offering underpricing', *Accounting and Finance*, 48 (3): 391 – 416.

Clarkson, P. M., and D. Simunic (1994), 'The association between audit quality, retained ownership, and firm-specific risk in U.S. and Canadian IPO markets', *Journal of Accounting and Economics*, 17: 207-228.

Clarkson, P. M. and J. Merkley (1994), 'Ex Ante Uncertainty and the Underpricing of Initial Public Offerings: Further Canadian Evidence', *Canadian Journal of Administrative Sciences*, II(1): 54-67.

Chi, J. and C. Padgett (2005), 'Short-run underpricing and its characteristics in Chinese initial public offering (IPO) markets', *Research in International Business and Finance*, 19 (1) : 71-93.

Chowdhry, B. and A. Sherman (1996), 'The winner's curse and international methods of allocating initial public earnings', Pacific-Basin Finance Journal, 4: 15-30.

Daily C.M., Certo S.T. , Dalton D. R. (2005), 'Investment bankers and IPO pricing: does prospectus information matter?', Journal of Business Venturing 20 (2005) 93–11.

Daily, C.M., S.T. Certo, D.R. Dalton, and R. Roengpitya (2003), 'IPO underpricing: a meta-analysis and research synthesis', *Entrepreneurship: Theory and Practice*, 27 (3): 271–295.

Dawson, S.M. (1987), 'Secondary stock market performance of initial public offers, Hong Kong, Singapore and Malaysia' *Journal of Business Finance and Accounting*, 14(1) : 65-76.

Downes, D. and R. Heinkel (1982), 'Signaling and the valuation of unseasoned new issues', *Journal of Finance*, 37: 1–10.

Dubois M.(1989), 'Les entreprises qui s'introduisent en Bourse sont-elles sous évaluées?', *Journal de la Société de Statistique de Paris* 130 (1989), pp. 4–616.

Fernando, C., S. Krishnamurthy and P. A. Spindt (1999), 'Offer Price, Target Ownership Structure and IPO Performance'*, work paper*.

Finkle, T.A. (1998), 'The relationship between boards of directors and initial public offerings in the biotechnology industry', *Entrepreneurship Theory and Practice*, 22: 5–29.

Firth, M (1997), 'An analysis of the stock market performance of new issues in New Zealand', *Pacific Basin Finance Journal* 5 (1997) 63-85.

Gana M.R. and A. EL Ammari (2008), 'Initial Underpricing and Transfer of Shares on the Tunisian Stock Exchange', *Journal of Corporate Ownership and Control*, 5 (3): 434-444.

Gompers, P. and A. Metrick (1998), 'How are large institutions different from other investors? Why do these differences matter?',*Working paper*, Harvard Business School.

Hanley, K. W. (1993), 'Underpricing of initial public offerings and the partial adjustment phenomenon', *Journal of Financial Economics*, 34: 231–250.

Gajewski, J. F., and Gresse C. (2006), 'A Survey of the European IPO Market', ECMI Paper.

Gasbarro Dominic, Bundoo Sunil and Zumwalt J. Kenton (2003): 'Underpricing and Aftermarket Performance of IPO Firms in Mauritius', *Journal of Emerging Market Finance,* Vol. 2, No. 3, 315-335.

Grinblatt, M. and .C.Y, Hwang (1989), 'Signalling and the pricing of new issues', Journal of finance, *Journal of Finance* 44, 393-420.

Hensler, D. A., R. C. Rutherford and T. M. Springer (1997) 'The survival of initial public offerings in the aftermarket', *Journal of Financial Research*, 20: 93-110.

Ibbotson, R.G. (1975), 'Price performance of common stock new issues'*, Journal of Financial Economics*, 2: 232-272.

Ibbotson, R.G., Sindelar, J., and Ritter, J.R. (1988). 'Initial Public Offerings', Journal of Applied Corporate Finance, 1(2), 37- 45.

Ibbotson, R. G., J. Sindelar, and J. Ritter (1994), 'The market's problems with the pricing of initial public offerings', *Journal of Applied Corporate Finance*, 7: 66-74.

Jain, B.A. and O. Kini (1999), 'The life cycle of initial public offering firms', *Journal of Business Finance and Accounting*, 26: 1281-1307.

Jain, B. A. and O. Kini (2000), 'Does the presence of venture capitalists improve the survival profile of IPO firms?', *Journal of Business Finance and Accounting*, 27: 1139-1176.

Jacquillat, B. and J. G. Mac Donald (1974), 'L'efficacité de la procédure française d'introduction en Bourse', *Revue Banque*, 31–39.

Jacquillat, B., J. G. Mac Donald and J. Rolfo (1978), 'French auctions of common stock: New issues', *Journal of Business Finance*, 2: 305–322.

Jensen, M. C. and H.W. Meckling (1976), 'Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure', *Journal of Financial Economics*, 3 (4): pp. 305- 360.

Jenkinson, T.J., Ljungqvist, A.P., 2001, 'Going Public: The Theory and Evidence on How Companies Raise Equity' Finance', *Second ed. Oxford University Press.*

Jog, Vog. and Riding. R. (1987), 'Underpricing in Canadian IPOs', *Financial Analyst Journal*: 48-55.

Johnson, J.M. and R.E. Miller (1988), 'Investment banker prestige and the underpricing of initial public offering', *Financial Management,* (17):19–29.

Kandel, S., O. Sarig and A. Wohl (1999), 'The demand for stocks: an analysis of IPO auctions', *Review of Financial Studies*, 12: 227–247.

Kim, M. and J.R. Ritter (1999), 'Valuing IPO's', *Journal of Financial Economics'*, 53:409−437.

Kiymaz, H. (2000), 'The initial and aftermarket performance of IPO's in an emerging market: evidence from Istanbul Stock Exchange', *Journal of Multinational Financial Management*, 10: 213-227.

Larry Li , John Fowler and Tony Naughton (2008), ' Short Term Equity Returns of Chinese IPOs, 1999 to 2004 Excess Demand, Social Policy and Wealth Effects', *Journal of Emerging Market Financ*e, Vol. 7, No. 2, 197-214 (2008).

Lee, Keun and Chaisung Lim. (2001), 'Technological Regimes, Catch-up and Leapfrogging: Findings from the Korean Industries', *Research Policy*, 30, 459-483.

Loughran, T. and J. Ritter (1995), 'The new issues puzzle'*, Journal of Finance*, 50: 23-52.

Loughran, T. and J. R. Ritter (2002), 'Why don't issuers get upset about leaving money on the table in IPO's?', *Review of Financial Studies*, 15: 413-443.

Ljungqvist, A.P. (1997), 'Pricing initial public offerings: further evidence from Germany', *European Economic Review*, 41: 1309-1320.

Ljungqvist, .A, V. Nanda and R. Singh (2006), 'Hot Markets, Investor Sentiment and IPO Pricing', *The Journal of Business*, 2006 - Chicago Press.

Megginson, W.L. and K.A. Weiss (1991), 'Venture capitalist certification in initial public offerings', *Journal of finance*, 46: 879-903.

Megginson, W.L and L. Tian (2006), 'Extreme underpricing: determinants of Chinese IPO initial Returns', *working paper*, Peking University and the University of Oklahoma.

Michaely, R. and W. H. Shaw (1994), 'The Pricing of Initial Public Offerings: Tests of Adverse Selection and Signaling Theories', *Review of Financial Studies*, 7: 279-315.

Miller, R. E. and F. Reilly (1987), 'An examination of mispricing, returns, and uncertainty for initial public offerings', *Financial Management*, 16: 33–38.

Mok H.M.K. and Y.V. Hui (1998) 'Underpricing and aftermarket performance of IPO's in Shanghai, China', *Pacific-Basin Finance Journal*, 6: 453-474.

Mroczkowski, N. A. and G. Tanewski (2004), 'Using accounting standards to delineate family and non-family controlled firms'. Caulfield East, Victoria, Australia: *Working Paper*, Faculty of Business and Economics, Monash University.

Purnanandam, A.K., and B. Swaminathan (2004), 'Are IPO's really underpriced?', *Review of Financial Studies*, 17(3): 811-848.

Ritter, J. R. (1991), 'The long-run performance of initial public offerings', *Journal of Finance*, 42: 365-394.

Ritter, J. R. (1984), 'Signalling and the valuation of unseasoned new issues: A comment', *Journal of Finance,* 39: 1231-1237.

Ritter, Jay R., (1987), "The costs of going public", *Journal of Financial Economics* 19, 269-282.

Ritter, J. R. and I. Welch (2002), 'A review of IPO activity, pricing, and allocations', *Journal of Finance*, 57: 1795-1828.

Rock, K. (1986), 'Why new issues are underpriced', *Journal of Financial Economics*, 5: 187–212.

Ruud, J. S. (1993), 'Underwriter Price Support and the IPO Underpricing Puzzle', *Journal of Financial Economics*, 34: 135-152.

Schultz, P. (1993), 'Unit initial public offerings', *Journal of Financial Economics,* 34: 199-229.

Schultz.P.H and M.A. Zaman (1994), 'Aftermarket support and underpricing of initial public offerings', *Journal of Financial Economics*, 35 (2): 199-219.

Spiess, D.K. and R.H. Pettway (1997), 'The IPO and first seasoned equity sale: Issue proceeds, owner/manager wealth, and the underpricing signal', *Journal of Banking and Finance*, 21: 967–988.

Spiess, D.K and J. Affleck-Graves (1995), 'Underperformance in long-run stock returns following seasoned equity offerings'*, Journal of Financial Economics*, 38(3): 243-267.

Su, D. and B. M. Fleischer (1999), 'An Empirical Investigation of Underpricing in Chinese IPO's', *Pacific-Basin Finance Journal*, 7: 173-202.

Tian, G.L. (2003), 'Financial Regulations, Investment Risks, and Determinants of Chinese IPO Underpricing', *Working paper*, Peking University Management School and London.

Titman, B. and B. Trueman (1986), 'Information quality and the valuation of new issues', *Journal of Accounting and Economics*, 8: 159-172.

Titman, S. and R. Wessels (1988), 'The determinants of capital structure choice', *Journal of Finance*, (43): 1-19.

Uddin, M. H., (2001), 'An Investigation on Initial Public Offers in Malaysia', *a PhD thesis*, *National University of Singapore*.

Uddin, M.H (2008), 'An Empirical Examination of Intended and Unintended IPO Underpricing in Singapore and Malaysia', *International Research Journal of Finance and Economics*, (20): 56-74.

Xu, X. and W.Y. Wu (2002), 'The impact of underwriters' support on initial return of new issues', *Modern Economic Science*, (24): 80–86.

Yong, O. and Z. Isa (2003), 'Initial performance of new issues of shares in Malaysia', *Applied Economics*, 8: 919-930.

Welch, .I (1989), 'Seasoned offerings, imitation costs and the underpricing of initial public offerings', *Journal of finance* 44, 421-449.

BIOGRAPHY

Sarra Ben Slama Zouari is an Associate Professor of Finance at ISCAE, University of Tunis, Tunisia. Her research interests are banking, market efficiency and financial information and recently Islamic Finance. Institutional affiliation : Institut Supérieur de Comptabilité et d'Administration des Entreprises (ISCAE) de Tunis, membre de l'Unité de recherche DEFI –ESSEC de Tunis. e-mail address : zouari_sarra@yaho.fr Postal address: Rue Soud Maareb, Résidence Massinissa , Logement N°25- Ennasr II -2037- Tunis.

Abdelkader Boudriga is a Professor of Finance at ISCC, University of Carthage, Tunisia. He is also a visiting Professor at University of Orléans, France. His research interests are market efficiency, financial information and banking. His research has been published in journals such as Revue Tunisienne des Sciences de Gestion, Tunisia, Revue Libanaise de Gestion et d'Economie, Lebanon and Journal of Financial Economic Policy, Emerald Insight, the Afro Asian Journal of Finance and Accounting.
Institutional affiliation : Ecole Supérieure de Sciences Economiques et Commerciales (ESSEC) de Tunis, membre de l'Unité de recherche DEFI –ESSEC de Tunis et LEO, Université d'Orléans.
e-mail address : abdelkader.boudriga@fulbrightmail.org; Postal address: 4, Abu Zakaria Al Hafsi Street, 1004 Montfelury, Tunis, Tunisia.

Neila Boulila Taktak is an Associate Professor of Accounting at ESSECT, University of Tunis, Tunisia. Her research interests are accounts manipulations, international accounting standards and banking. Her research has been published in journals such as Comptabilité, Contrôle, Audit, France, Journal of Financial Economic Policy, Emeraldinsight ; Revue Libanaise de Gestion et d'Economie, Lebanon and International Journal of Economics and Finance, Canada . Institutional affiliation : Ecole Supérieure de Sciences Economiques et Commerciales (ESSEC) de Tunis, membre de l'Unité de recherche DEFI – ESSEC de Tunis. e-mail address : neila_boulila@yahoo.fr; Postal address: 4, Abu Zakaria Al Hafsi Street, 1004 Montfelury, Tunis, Tunisia.

DIVIDEND POLICY AND THE LIFE CYCLE HYPOTHESIS: EVIDENCE FROM TAIWAN

Ming-Hui Wang, Taiwan University of Science and Technology
Mei-Chu Ke, Chin-Yi University of Technology
Day-Yang Liu, Taiwan University of Science and Technology
Yen-Sheng Huang, Ming Chi University of Technology

ABSTRACT

This paper examines the dividend policy for firms listed on the Taiwan Stock Exchange and test the life cycle hypothesis. The sample involves 6031 observations of dividend payments over the 16-year period 1992-2007. Consistent with the prediction of the life cycle hypothesis, the results indicate that dividend payers (cash dividends, stock dividends, or both) are associated with higher profitability, higher asset growth rate, and higher market-to-book ratio than non-payers (none dividends). The median return on assets (ROA) is 7.03% for dividend payers and -0.93% for non-payers. Similarly, the median market-to-book ratio is 1.69 for dividend payers as opposed to 0.80 for non-payers. Moreover, the results indicate that stock-dividend payers are associated with higher asset growth rate, but lower ratio of retained earnings to total equity than those for cash-dividend payers. In particular, stock-dividend payers are associated with higher asset growth rate and lower return on assets, lower retained to total equity ratio than those for cash-dividend payers. These results are consistent with the life cycle hypothesis of dividend payment in that younger firms with higher growth potential but lower profitability tend to distribute more stock dividends than cash dividends. When firms become more mature as characterized by lower growth potential but higher profitability tend to distribute more cash dividends as opposed to stock dividends.

JEL: G32; G35

KEYWORDS: dividend policy, cash dividend, stock dividend, life cycle hypothesis

INTRODUCTION

Ever since Miller and Modigliani (1961) published their pioneering article on dividend policy, numerous theoretic and empirical studies have examined this important issue. Empirical evidence suggests that a firm's dividend policy may depend on the stage of the firm's life cycle. For example, younger firms with higher growth opportunities but lower profitability may distribute less cash dividends. In contrast, mature firms with higher profitability but lower growth opportunities may distribute more cash dividends. The past two decades have witnessed drastic changes in dividend policy among industrial firms. Fama and French (2001) report a significant decline in the proportion of United States industrial firms that pay cash dividends in the period 1978-99. They note that such changes in dividend policy are related to changing characteristics of these publicly traded firms. DeAngelo et al. (2006) propose that changes in dividend policy of publicly traded industrial firms in the United States are consistent with the prediction of the life cycle hypothesis.

The purpose of this paper is to examine dividend policy for industrial firms listed on the Taiwan Stock Exchange over the period 1992-2007. In particular, we examine whether the dividend policy of Taiwan's industrial firms are consistent with the prediction of the life cycle hypothesis. We first examine the pattern of dividend payments for industrial firms listed on the Taiwan Stock Exchange over the sample period. That is, we examine if there is any change in the proportion between dividend payers and non-payers? Moreover, since both stock dividends and cash dividends are quite common for firms listed on the Taiwan Stock Exchange, we examine whether dividend payers change their choice between stock dividends and cash dividends in the sample period. Finally, we examine whether the choice between stock dividends and cash dividends is consistent with the prediction of the life cycle hypothesis.

Unlike the United States firms which distributed mainly cash dividends in the past two decades, industrial firms listed on the Taiwan Stock Exchange declared more stock dividends than cash dividends especially in the early years of 1990s. Moreover, stock dividends appear to be more common than cash dividends for firms in the high growth industries such as the electronic industry. One plausible explanation for the pattern of more stock dividends than cash dividends is that these firms may be in their youth stage of life cycle as characterized by higher growth opportunity. However, the latter part of the sample period has witnessed a drastic shift from stock dividends to cash dividends for these firms. In addition, the proportion of non-payers has also increased. This change in the dividend policy may be due to the situation that these firms were moving toward a more mature stage of life cycle as characterized by lower growth opportunity.

To test the validity of the life cycle hypothesis of dividend policy, we examine whether the shift in the choice from stock dividends to cash dividends is related to the changing characteristics of listed stocks. Alternatively, the shift in dividend policy could be due to the changing propensity of listed stocks to pay dividends (e.g., Fama and French, 2001). Thus, we examine whether firms that distribute cash dividends are characterized by lower growth opportunity, higher profitability, and large size as compared to those that distribute stock dividends. Following DeAngelo et al., 2006, we also examine whether the earned/contributed capital mix provides a better explanation of the observed dividend changes.

Our data involve 6031 sample observations from stocks listed on the Taiwan Stock Exchange, ranging from 149 industrial firms in 1992 to 619 industrial firms in 2007. Over the sample period 1992-2007, we observe a drastic increase in the proportion of dividend non-payers. Moreover, among dividend payers, we observe a drastic shift from stock dividends to cash dividends. The proportion of dividend non-payers increases from 10.8% in the first half of the sample period to 28.7% in the second half of the sample period. Moreover, for dividend payers, the proportion of firms paying stock dividends decreases from 59.5% in the first half of sample period to 10.6% in the second half of the sample period. In contrast, the corresponding ratio increases from 4.4% to 20.0% for cash dividends. When dividend payments are measured in terms of dollar amount, the results are comparable. The average stock dividend per share decreases by 61% from (New Taiwan Dollar) NT$ 1.30 in the first half of the sample period to NT$ 0.51 in the second half of the sample period. In contrast, the cash dividend per share increases by 172% from NT$ 0.25 to NT$ 0.68 per share.

The results also indicate that dividend payers (cash dividends, stock dividends, or both) are associated with higher profitability, higher asset growth rate, and higher market-to-book ratio than non-payers (none dividends). The median return on total assets (ROA) is 7.03% for dividend payers and -0.93% for non-payers. Similarly, the median market-to-book ratio is 1.69 for dividend payers as opposed to 0.80 for non-payers. Moreover, the results indicate that stock-dividend payers are associated with higher asset growth rate, but lower profitability as measured by return on total assets as well as lower retained earnings to total equity ratio than cash-dividend payers. These results are consistent with the prediction of the life cycle hypothesis in that younger firms with higher growth potential but lower profitability tend to distribute more stock dividends than cash dividends. When firms become more mature as characterized by lower growth potential but higher profitability tend to distribute more cash dividends as opposed to stock dividends.

Previous research from the United States financial market documents a declining pattern of cash dividends (e.g., Fama and French, 2001). In contrast, our empirical evidence indicates an increasing trend of cash dividends but a declining trend for stock dividends in the sample period 1992-2007. Despite the difference in empirical evidence between our empirical results and those derived from the United States financial market, we argue that the pattern of increasing cash dividends and declining stock dividends in the Taiwan stock market is consistent with the prediction of the life cycle hypothesis as suggested in DeAngelo et al. (2006), among others. Moreover, our results indicate that the distribution of stock dividends and/or cash dividends appears to be affected by the long-term profitability as measured by the ratio of retained earnings to total equity, aside from other factors such as the growth opportunity as measured by the asset growth rate (△TA/TA) and the short-term profitability as measured by the return on total assets (ROA). The plan of this paper is as follow. Section 2 provides a review of relevant literature. Section 3 describes data and methodology. Section 4 reports empirical results. Section 5 concludes this paper.

LITERATURE REVIEW

Miller and Modigliani (1961) argue that, in a frictionless market, dividend payout policy is irrelevant and that investment policy alone is the only determinant of firm value. In this perfect world, firm value is determined by the net present value of cash flows generated by the investment opportunity unique to a firm. To keep the investment opportunity fixed, Miller and Modigliani (1961) assume a 100% distribution of free cash flow to shareholders in every time period. When the assumptions are relaxed to allow retention, DeAngelo and DeAngelo (2006) argue that dividend payout policy matters in exactly the same way as investment policy does. They suggest that the maximization of firm value requires the payout policy to be optimized.

In the real world, financial managers appear to consider dividend policy as a relevant decision. In a survey of 384 financial executives, Brav et al. (2005) report that eighty percent of the financial executives believe that dividend payout policy conveys information to market participants. Moreover, financial managers appear to make the dividend policy in a conservative way. The survey indicates that maintaining the dividend level is of equal importance as investment decisions. For example, 94% of dividend payers strongly agree that they try to avoid reducing dividends. And more than two-thirds of dividend payers state that the stability of future earnings is an important factor affecting dividend payout decisions. For firms that pay no dividends, the financial executives argue that dividend inflexibility make them hesitate to pay cash dividends.

The relevance of dividend policy in the real world can be seen from the changing pattern of dividend payments in the past decades. Fama and French (2001) report a drastic decline in the proportion of United States industrial firms that pay cash dividends in the period 1978-99. They note that both changing firm characteristics and low propensity to pay cash dividends are responsible for the declining cash dividends. On the one hand, newly listed firms tend to be smaller with lower profitability and stronger growth opportunity. These characteristics are typical for firms that never paid cash dividends. On the other hand, even after controlling for firm characteristics, firms have become less likely to pay cash dividends across all groups ranked by size, profitability, and growth opportunity.

Fama and French (2001), Grullon et al. (2002), DeAngelo and DeAngelo (2006), DeAngelo et al. (2006), among others, suggest that dividend policy requires a trade-off between the pros and cons of retention versus distribution of corporate earnings. For example, while retention of earnings provides the benefit of floatation cost savings in funding investment needs, distribution of earnings minimize potential agency costs of free cash flow which is under the discretion of incumbent managers.

The trade-off of retention versus distribution is associated with the life cycle of firms. For firms at their younger stages, retention dominates distribution because younger firms are characterized by smaller size, lower profitability and stronger growth opportunity. As a result, a smaller portion of earnings is more likely to be distributed. For these firms, the benefit of retention outweighs the cost of distribution. In contrast, more mature and established firms are more likely to distribute earnings to shareholders. These firms are characterized by lower investment opportunity, high profitability, and larger firm size. Hence, the cost of retaining earnings (e.g., the agency costs derived from free cash flow) tend to more than offset the benefit of floating cost saving.

Although the life cycle of firms tends to be characterized by investment opportunity, profitability and firm size, DeAngelo et al. (2006) suggest that the earned/contributed capital mix (i.e., the ratio of retained earnings to total equity) provides a better measure of a firm's life cycle that is relevant to the choice of firms' dividend payments. They propose that the ratio of retained earnings to total equity is a better measure of long-term profitability and thus is more relevant to the dividend decision. Their empirical evidence indicates that the proportion of industrial firms that pay cash dividends is significantly related to the retained/contributed capital mix even after controlling for the impact of other variables such as firm size, profitability, and growth opportunity.

HYPOTHESIS AND METHODOLOGY

The life cycle hypothesis proposes that dividend policy is associated with firms' life cycle. Younger firms with higher growth opportunity but lower profitability tend to retain a larger portion of earnings. For these firms, retention dominates distribution because savings from lower flotation costs more than offset the benefit of lower agency costs from free cash flow. In contrast, mature firms with lower growth opportunity but higher profitability tend to distribute a larger portion of earnings. For these firms, distribution dominates retention since the benefits of distribution (e.g., lower agency costs derived from free cash flow) outweigh the savings of retention (e.g., lower flotation costs).

In particular the life cycle hypothesis would predict higher profitability for dividend payers (stock dividends, cash dividends, or a max of stock and cash dividends) than for non-payers (none dividends). According to the regulation, the retained earnings must be sufficient to cover the dividend payments in order for firms to distribute dividends (cash dividends or stock dividends). Since retained earnings reflect the long-term profitability in the past years, a firm with poor long-term profitability is unable to distribute dividends.

Moreover, the life cycle hypothesis would predict higher growth opportunity but lower profitability for firms that pay stock dividends than for cash dividends. For firms with higher growth opportunity but lower profitability, the demand for capital to implement profitable investment opportunity is higher. Thus, the savings from floatation costs may dominate the agency costs from free cash flow. Therefore, these firms may tend to distribute stock dividends rather than cash dividends. In contrast, for firms with lower growth opportunity but higher profitability, the agency costs from free cash flow may outweigh the costs of floating new security. Thus, these firms pay prefer to distribute cash dividends rather than stock dividends.

<u>Data and the Summary Statistics of Dividend Payments</u>

The sample includes all non-financial firms listed on the Taiwan Stock Exchange over the 16 years from 1992 to 2007. The sample period is selected in view of the availability of data. The first year is chosen since a relatively smaller number of stocks were listed on the Taiwan Stock Exchange prior to that year. The last year is selected since the financial data are made available only until recently. Following previous research (e.g., Fama and French (2001), DeAngelo et al. (2006)), we exclude financial firms because there firms operate in a highly regulated environment. Moreover, to be included in the sample, a firm must have non-missing values on dividends and earnings in the financial database provided by the data vendor (i.e., the Taiwan Economic Journal). The values of cash dividends, stock dividends and other financial variables are collected for each sample firm. The screening procedure results in sample firms ranging from 149 firms in 1992 to 619 firms in 2007 with a total of 6031 sample observations of dividend payments.

METHODOLOGY

We first examine whether the pattern of different types of dividend payments among sample firms has changed over the sample period. Sample firms are first classified into dividend payers and non-payers. Thus, our first objective is to examine whether the proportion of dividend payers and non-payers changes over the sample period. For dividend payers, firms may distribute stock dividends only, cash dividends only, or distribute a mix of both stock dividends and cash dividends. Thus, for dividend payers, we examine whether the proportion of stock dividends, cash dividends, and the mix of stock dividends and cash dividends changes in the sample period.

We then examine whether firms' dividend policy is consistent with the prediction of the life cycle hypothesis. Firm characteristics are measured via profitability, growth opportunity, and firm size (e.g., Fama and French, 2001). We first examine firm characteristics between dividend payers and non-payers. According to the life cycle hypothesis, dividend payers should be more profitable than non-payers. Moreover, we examine firm characteristics among firms that distribute stock dividends and cash dividends. According to the life cycle hypothesis, firms distribute stock dividends should be characterized by higher growth opportunity but lower profitability.

Fama and French (2001) note that changing pattern of dividend payments can be due to two potential sources. On the one hand, characteristics of newly listed firms may differ from those originally listed on the stock exchange. Fama and French (2001) examine the United Stated industrial firms and suggest that newly listed firms tend to be smaller with low profitability and strong growth opportunities, which provides a partial explanation for the finding of declining cash dividends observed in the United States market. On the other hand, characteristics of originally listed firms may change as time progresses over the sample period. For example, Fama and French (2001) document a lower propensity of firms to pay cash dividends after controlling for the impact of other firm characteristics.

Following Fama and French (2001), we examine whether characteristics of newly listed firms differ from those originally listed on the Taiwan Stock Exchange. For convenience, we define newly listed stocks as sample firms listed on the Taiwan Stock Exchange within the sample period 1992-2007. In contrast, firms listed on the Taiwan Stock Exchange prior to 1992 are referred to as the originally listed stocks. We then examine whether firm characteristics of newly listed firms differ from those of the originally listed firms. This allows us to examine whether any potential changes in dividend policy are contributed by newly listed firms.

Moreover, we examine the propensity of originally listed firms to pay cash/stock dividends over the sample period. This allows us to examine whether originally listed firms also change their dividend policy. If so, we examine whether the propensity of originally listed stocks to pay dividends is associated with changing firm characteristics including profitability, growth opportunity, and firm size.

Aside from firm characteristics such as profitability, growth opportunity, and firm size, DeAngelo et al. (2006) document a highly significant relation between the decision to pay dividend and the earned/contributed capital mix after controlling for the impact of profitability, growth, and firm size. The rationale is that the ratio of retained earnings to total equity provides a long-term measure of profitability, which is likely an important factor in affecting a firm's dividend policy. To examine this possibility, we also examine whether the ratio of retained earnings to total equity represents a better measure of a firm's life cycle in affecting the dividend decision.

EMPIRICAL RESULTS

Table 1 and Figure 1 report the distribution of four types of dividend payers over the sample period 1992-2007. Over the whole sample period, the results indicate that 74.9% of the 6031 sample observations belong to dividend payers with the remaining 25.1% belong to non-payers. Of the 74.9% observations with dividend payments, stock dividends account for 20.4%, cash dividends 16.9%, and those involving a mix of both stock and cash dividends account for 37.6%.

When the whole sample period is divided into two sub-periods where 1992-1997 is the first sub-period and 1998-2007 is the second sub-period. The results indicate a drastic change in the proportion of the four types of dividend payments as time progresses in the sample period. In particular, the proportion of sample firms that pay stock dividends decreases drastically from 59.5% in the first sub-period of 1992-97 to 10.6% in the second sub-period of 1998-2007. In comparison, the proportion of sample firms that pay cash dividends increases from 4.4% in the first sub-period to 20.0% in the second sub-period. Similarly, the proportion of sample firms paying a mix of cash and stock dividends increases from 25.3% in the first sub-period to 40.7% in the second sub-period. Finally, the proportion for non-payers increases from

10.8% in the first sub-period to 28.7% in the second sub-period. Figure 1 plots the trend for the four types of dividend payers. The figure indicates a rising trend for the proportion of cash-dividend payers, mixed payers, and non-payers, but a downward trend for the stock-dividend payers in the sample period.

Table 1: The Distribution of the Four Types of Dividend Payers over the Sample Period 1992-2007

	All samples	Stock dividends		Both dividends		Cash dividends		None dividends	
Year	N	n	%	n	%	n	%	n	%
	(1)	(2)	(2)/(1)	(3)	(3)/(1)	(4)	(4)/(1)	(5)	(5)/(1)
1992	149	70	47.0	44	29.5	10	6.7	25	16.8
1993	146	86	58.9	48	32.9	9	6.2	3	2.1
1994	190	108	56.8	57	30.0	6	3.2	19	10.0
1995	218	109	50.0	67	30.7	12	5.5	30	13.8
1996	242	157	64.9	49	20.2	7	2.9	29	12.0
1997	267	191	71.5	42	15.7	9	3.4	25	9.4
1998	282	123	43.6	78	27.7	14	5.0	67	23.8
1999	322	109	33.9	102	31.7	19	5.9	92	28.6
2000	371	65	17.5	132	35.6	44	11.9	130	35.0
2001	432	53	12.3	130	30.1	73	16.9	176	40.7
2002	509	41	8.1	197	38.7	98	19.3	173	34.0
2003	537	41	7.6	246	45.8	99	18.4	151	28.1
2004	576	26	4.5	279	48.4	117	20.3	154	26.7
2005	580	21	3.6	250	43.1	143	24.7	166	28.6
2006	591	11	1.9	255	43.1	174	29.4	151	25.5
2007	619	20	3.2	290	46.8	184	29.7	125	20.2
1992-1997	1212	721	59.5	307	25.3	53	4.4	131	10.8
1998-2007	4819	510	10.6	1959	40.7	965	20.0	1385	28.7
1992-2007	6031	1231	20.4	2266	37.6	1018	16.9	1516	25.1

This table reports the distribution of four types of dividend-paying samples (stock dividends only, both stock and cash dividends, cash dividends only, none dividends) over the sample period 1992-2007.

Alternatively, we may estimate the dollar amount of cash dividends and stock dividends from the three types of dividend payers (cash dividends only, stock dividends only, and a mix of both cash and stock dividends). The dollar amount of stock dividends is estimated by multiplying the number of shares declared as stock dividends by the par value per share, which is NT$10. Similarly, for sample firms paying a mix of both cash and stock dividends, the dollar amount of stock dividends is estimated in a similar way. The distribution of stock dividends requires a decrease in either the additional paid-in capital or the retained earnings or both. Similarly, the declaration of cash dividend requires a decrease in retained earnings. Thus, we estimate the dollar amount of stock dividends from the perspective of how much retained earnings and/or additional paid-in capital is removed to the capital account. These dollar amounts of cash dividends and stock dividends are averaged across sample firms for each year in the sample period.

Figure 1: The Proportion of the Four Types of Dividend Payers-Sample Period 1992-2007

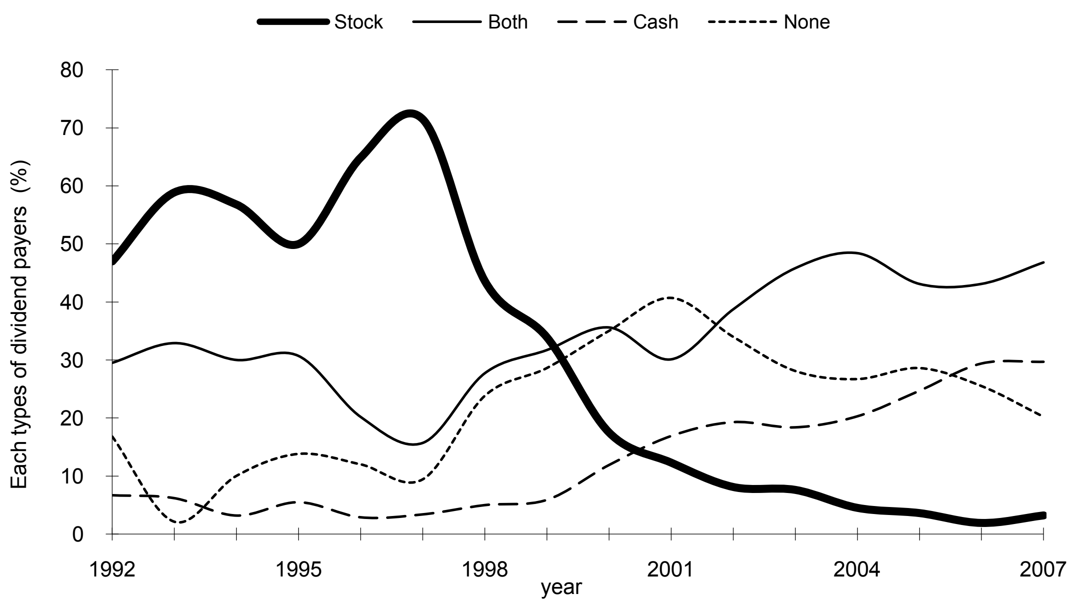


Figure 1 shows the Proportion of the Four Types of Dividend Payers (stock dividends only, cash dividends only, a mix of cash and stock dividends, none dividends) over the Sample Period 1992-2007._The horizon axle is the sample period which extends from 1992 to 2007. The vertical axle reports the proportion of the four types of dividend payers.

Table 2 reports the results for the dollar amount of cash dividends and stock dividends per share of common stock for dividend payers in the sample period. The results indicate that the total dollar amount of dividends per share of common stock, which includes both the cash dividends and the stock dividends, is NT$1.33 over the whole sample period. Since the par value is NT$10 per share for all listed stocks on the Taiwan Stock Exchange, the distribution of dividends amounts to 13.3% of par value for dividend payers, of which 5.2% in the form of cash dividends and 8.1% in the form of stock dividends. However, the dollar amount of dividends indicates a declining trend in the whole sample period. The total dollar amount of dividend decreases by 23% from NT$ 1.55 per share in the first sub-period to NT$1.19 in the second sub-period. The major decline in the total dollar amount of dividends comes from the significant drop in the dollar amount of stock dividends, which decreases by 61% from NT$1.30 in the first sub-period to NT$0.51 in the second sub-period. Moreover, the stock dividends experience a significant decline from both sources of pain-in capital and retained earnings. In contrast, the dollar amount of cash dividends experiences a significant increase of 172% from NT$0.25 in the first sub-period to NT$0.68 in the second sub-period. As a result, the proportion of the dollar amount of stock dividends to the dollar amount of total dividends drops from 83.5% in the first sub-period to 45.8% in the second sub-period.

Table 3 reports the aggregate dollar amount of cash dividends and stock dividends per year across all dividend payers. The results indicate the aggregate dollar amount for all dividend payers increases from NT$116 billion per year in the first sub-period to NT$463 billion per year in the second sub-period. However, this increase in aggregate dollar amount of dividends is contributed mainly by the increase in the dollar amount of cash dividends. The aggregate dollar amount for cash dividends increases by 13 times from NT$23.3 billion per year in the first sub-period to NT$330.4 billion per year in the second sub-period. In contrast, the aggregate dollar amount for stock dividends increases only by 43% from NT$92.9 billion per year in the first sub-period to NT$132.6 billion per year in the second sub-period. Thus, consistent with the results in Table 2, the proportion of the aggregate amount for stock dividends to that for total dividends drops significantly from 76.3% in the first sub-period to 38.9% in the second sub-period. Figure 2 plots the time trend for the proportion of the dollar amount for stock dividends to that for total dividends.

Table 2: The Dollar Amount of Cash Dividends and Stock Dividends per Share over the Sample Period 1992-2007

Year	Cash dividends	Earning dividends	Paid-in capital dividends	Stock dividends	Total dividends	Stock dividend ratio (%)
	(1)	(2)	(3)	(4)=(2)+(3)	(5)=(1)+(4)	(6)=(4)/(5)*100
1992	0.35	0.63	0.43	1.07	1.42	75.38
1993	0.33	0.90	0.49	1.39	1.73	80.69
1994	0.27	0.88	0.43	1.31	1.58	83.19
1995	0.27	0.70	0.41	1.10	1.37	80.44
1996	0.17	0.85	0.47	1.32	1.49	88.79
1997	0.12	1.00	0.59	1.59	1.71	92.70
1998	0.25	0.63	0.33	0.96	1.21	79.40
1999	0.25	0.58	0.29	0.87	1.12	77.52
2000	0.32	0.48	0.15	0.63	0.95	66.70
2001	0.34	0.33	0.10	0.43	0.77	56.03
2002	0.54	0.35	0.07	0.42	0.96	43.66
2003	0.71	0.39	0.07	0.45	1.16	39.02
2004	0.88	0.37	0.06	0.43	1.31	32.76
2005	0.96	0.30	0.03	0.34	1.29	25.94
2006	1.17	0.25	0.03	0.28	1.45	19.12
2007	1.38	0.26	0.03	0.30	1.67	17.62
1992-1997	0.25	0.83	0.47	1.30	1.55	83.53
1998-2007	0.68	0.39	0.12	0.51	1.19	45.78
1992-2007	0.52	0.56	0.25	0.81	1.33	59.93

The table reports the dollar amount (in NT$) of cash dividends and stock dividends per share over the sample period 1992-2007. The dollar amount of stock dividends is further divided into two sources: paid-in capital and retained earnings. The stock dividend ratio is the proportion of the dollar amount for stock dividends per share to that for the total dividends.

Table 4 reports the median values of firm attributes over the sample period 1992-2007. Columns (3) and (4) of Panel A indicate that sample firms experience higher profitability in the first sub-period than that in the second sub-period. The median return on assets (ROA) decreases from 6.17% in the first sub-period to 4.96% in the second sub-period. Similarly, the return on equity (ROE) drops from 7.99% in the first sub-period to 6.92% in the second sub-period. Moreover, the sample firms experience higher growth rate in the first sub-period than that in the second sub-period. The asset growth rate (△TA/TA) is 12.59% in the first sub-period as opposed to 4.72% in the second sub-period. Similarly, the market-to-book ratio of 2.48 in the first sub-period is about twice the ratio of 1.20 in the second sub-period.

Table 3: The Aggregate Dollar Amount of Cash Dividends and Stock Dividends over the Sample Period 1992-2007

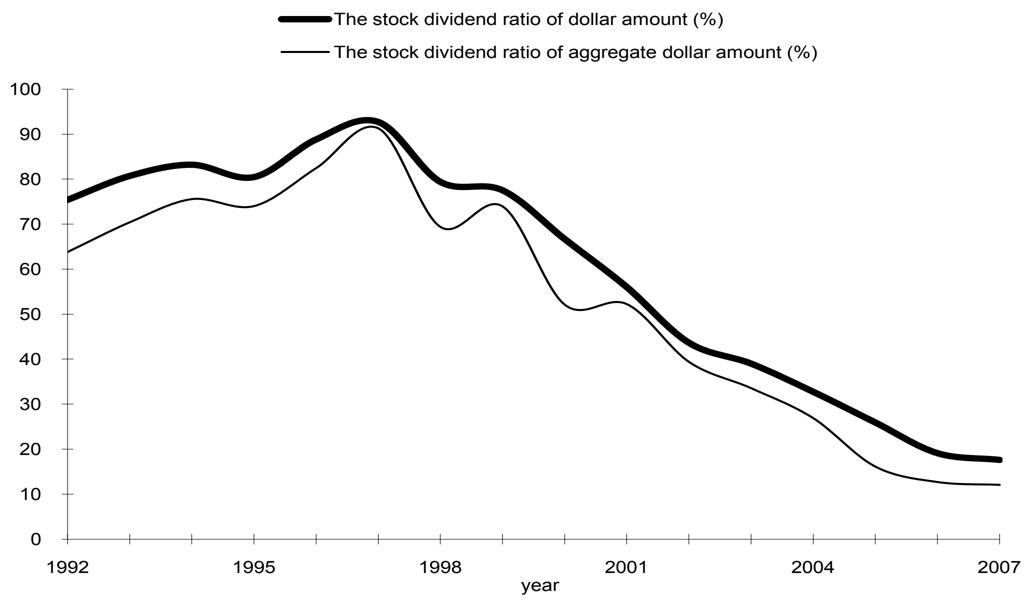
Year	Total cash	Total earning	Total paid-in capital	Total stock	Total dividends	Stock dividend ratio (%)
	(1)	(2)	(3)	(4)=(2)+(3)	(5)=(1)+(4)	(6)=(4)/(5)*100
1992	23.12	25.24	15.51	40.76	63.87	63.81
1993	22.30	33.89	19.18	53.07	75.36	70.41
1994	23.64	53.56	19.51	73.07	96.71	75.56
1995	26.89	52.86	23.72	76.58	103.47	74.01
1996	25.28	77.72	40.93	118.66	143.93	82.44
1997	18.60	134.17	60.77	194.94	213.53	91.29
1998	60.34	89.98	46.81	136.79	197.13	69.39
1999	63.89	126.03	55.33	181.36	245.26	73.95
2000	131.11	111.69	31.02	142.71	273.82	52.12
2001	110.54	95.85	25.01	120.86	231.40	52.23
2002	178.01	93.93	21.78	115.71	293.72	39.40
2003	297.61	129.36	20.99	150.35	447.96	33.56
2004	458.22	148.83	19.79	168.62	626.85	26.90
2005	535.06	89.36	13.56	102.92	637.98	16.13
2006	648.59	78.74	15.65	94.39	742.98	12.70
2007	820.38	100.16	12.45	112.61	932.99	12.07
1992-1997	23.30	62.91	29.94	92.85	116.15	76.25
1998-2007	330.38	106.39	26.24	132.63	463.01	38.85
1992-2007	215.22	90.09	27.63	117.71	332.94	52.87

The table reports the aggregate dollar amount (in NT$ billion) of cash dividends and stock dividends for all payers over the sample period 1992-2007. The stock dividend ratio is the proportion of the aggregate dollar amount for total stock dividends to that for total dividends.

When firm attributes for dividend payers are compared with those for non-payers, Columns (5) and (6) of Panel A indicate that dividend payers are associated with higher profitability, higher asset growth rate, higher market-to-book ratio. For example, the median return on assets (ROA) is 7.03% for dividend payers and -0.93% for non-payers. Similarly, the median market-to-book ratio is 1.69 for dividend payers as opposed to 0.80 for non-payers.

When sample observations are classified into originally-listed firms (firms listed on the stock exchange throughout the whole sample period) and newly-listed firms (firms newly-listed within the sample period), Columns (3) and (4) of Panel B indicate that newly-listed firms are associated with higher profitability, higher growth rate, and slightly higher market-to-book ratio. For example, the median return on equity is 8.98% for the newly-listed firms as opposed to the 5.29% for the originally-listed firms. Similarly, the asset growth rate ($\triangle$TA/TA) is 7.63% for the newly-listed firms as opposed to 4.18% for the originally-listed firms. When sample firms are classified by industry into high-tech versus non-high-tech industry (i.e., electronic industry), Columns (5) and (6) of Panel B indicate that high-tech firms are associated with higher profitability, higher growth rate, and higher market-to-book ratio.

Figure 2: The Ratio of Stock Dividends to Total Dividends over the Sample Period 1992-2007.



The figure displays the ratio of stock dividends to total dividends over the sample period 1992-2007. The solid curve is derived from Table 2 where the ratio indicates the proportion of the dollar amount for stock dividends per share to that for the total dividends. The dotted curve is derived from Table 3 where the ratio indicates the proportion of the aggregate dollar amount for stock dividends to that for the total dividends.

One plausible explanation for the higher profitability of the newly-listed firms is that there firms tend to be in the high-tech industry. Table 5 reports the breakdown of sample observations classified by both listing time and industry. Column (4) indicates that only 89% (2044 out of 2301 observations) of the originally-listed firms belong to the non-high-tech industry. In comparison, 49% (1831 out of 3730 observations) of the newly-listed firms belong to the high-tech industry. The pattern suggests that firms newly listed on the stock exchange within the sample period tend to be in the high-tech industry than those originally listed firms. Moreover, the fourth row of Table 5 indicates that 82% (3051 out of 3730 observations) of the newly-listed observations enter the stock exchange in the second sub-period.

To examine the difference in firm attributes between dividend payers and non-payers, the following logistic regressions are estimated:

$$Y = \alpha + \beta_1(\log(SIZE)) + \beta_2(ROA) + \beta_3(\Delta TA / TA) \quad (1)$$

$$Y = \alpha + \beta_1(\log(SIZE)) + \beta_2(RE / TE) + \beta_3(ROA) + \beta_4(\Delta TA / TA) \quad (2)$$

The dependent variable *(Y)* is a dummy variable set to one for dividend payers (including cash dividends only, stock dividends only, and a mix of cash and stock dividends) and zero for non-payers. The explanatory variables include the logarithm of total assets (log(SIZE)), return on assets (ROA), retained earnings to equity ratio (RE/TE), and total assets growth rate (△TA/TA). Ordinary Least Squares estimates were obtained. The results are presented in Table 6.

Table 4: Summary Statistics of Firm Attributes over the Sample Period 1992-2007

Panel A					
Variable	**Whole Sample (1992~2007)**	**First-sub Period (1992~1997)**	**Second Sub-period (1998~2007)**	**Dividends Payers**	**Non-Payers**
(1)	(2)	(3)	(4)	(5)	(6)
Log(SIZE)	9.76	9.70	9.77	9.77	9.72
RE/TE	9.69	11.05	9.20	13.41	−7.60
ROA	5.23	6.17	4.96	7.03	−0.93
ROE	7.16	7.99	6.92	9.87	−3.47
NI/Sales	6.03	6.91	5.54	8.38	−3.67
△TA/TA	6.15	12.59	4.72	9.32	−2.77
△NI/NI	10.05	10.86	9.86	14.40	−46.27
MTB	1.42	2.48	1.20	1.69	0.80
OBS	6031	1212	4819	4515	1516

Panel B					
	Non-Payers	**Originally-Listed Firms**	**Newly Listed Firms**	**High-Tech Firms**	**Non-High-Tech Firms**
(1)	(6)	(7)	(8)	(9)	(10)
Log(SIZE)	9.89	9.66	9.73	9.77	9.89
RE/TE	7.29	11.57	13.38	8.26	7.29
ROA	4.31	6.05	7.49	4.48	4.31
ROE	5.29	8.98	10.69	5.90	5.29
NI/Sales	5.71	6.22	7.12	5.45	5.71
△TA/TA	4.18	7.63	10.34	4.52	4.18
△NI/NI	7.80	10.80	14.10	7.80	7.80
MTB	1.40	1.44	1.72	1.26	1.40
OBS	2301	3730	2088	3943	2301

The table reports median values of firm attributes over the sample period 1992-2007. The total sample involves 6031 observations over the sample period 1992-2007. Dividend payers include firms that pay cash dividends only, stock dividends only, and a mix of cash and stock dividends. Non-payers are the firms that pay neither cash dividends nor stock dividends. Originally-listed firms refer to firms that were listed throughout the whole sample period 1992-2007. Newly-listed firms refer to firms that were newly listed within the sample period 1992-2007. High-Tech firms refer to firms in the IT industry with non-high-tech firms in other industries. SIZE is measured as the logarithms of total assets, log (total asset), where total assets are measured in NT\$. RE/TE is the ratio of retained earnings to equity (in %). ROA is the return on total assets, measured as the ratio of net income to total assets (in %). ROE is the return on equity (in %). NI/Sales is the ratio of net income to sales (in %). △TA/TA is the growth rate of total assets (in %). △NI/NI is the growth rate of net income (in %). MTB is the ratio of market value to book value. OBS is the total number of observations.

Table 6 presents whether firm attributes differ between dividend payers (including cash dividends only, stock dividends only, and a mix of both cash dividends and stock dividends) and non-payers (none dividends) through multivariate logistic regressions. The dependent variable is a dummy variable set to one for dividend payers and zero for non-payers.

Table 6a indicates that return on assets (ROA) is significantly higher for dividend payers than that for non-payers in each of the 16-year sample period. This result is consistent with the prediction of the life cycle hypothesis in that dividend payers are more profitable than non-payers. Moreover, dividend payers are associated with higher asset growth rates than non-payers. The regression coefficients associated with the asset growth variable, total assets growth rate (△TA/TA), are generally insignificantly positive.

Table 6b reports similar regression results by adding an additional variable, the ratio of retained earnings to total equity (RE/TE). The results indicate that this variable is significantly positive in almost each year of the sample period. The other profitability variable, ROA, is still significantly positive in most sample years although the t-values become lower than those in Table 6a where the retained earning variable, RE/TE is not included. The results support the notion that long-term profitability as measured by the ratio of retained earnings to total equity is an important factor in affecting the dividend policy.

Table 5: Classification of Sample Observations by Both time of Listing and Industry

Groups	**1992-1999**	**2000-2007**	**1992-2007**
(1)	(2)	(3)	(4)
Originally-listed firms			
High-Tech industry	127	130	257
Non-high-tech industry	1010	1034	2044
Sub-total	1137	1164	2301
Newly-list firms			
High-tech industry	191	1640	1831
Non-high-tech industry	488	1411	1899
Sub-total	679	3051	3730
Total	1816	4215	6031

The table reports the number of observations for sample firms classified by the time of listing as well as by industry. Sample firms are sorted according to whether they were listed throughout the whole sample period 1992-2007 (originally-listed) or within the sample period (newly-listed) and by industry (high-tech versus non-high-tech)

Table 7 compares firm attributes between firms that distribute stock dividends only and firms that distribute cash dividends only via multivariate logistic regressions. The dependent variable is a dummy variable set to one for firms paying stock dividends only and zero for firms paying cash dividends only. Consistent with the prediction of the life cycle hypothesis, Table 7a indicates that firms paying stock dividends only are associated with higher growth rate but lower profitability.

The coefficients associated with the growth variable, △TA/TA, are mostly significantly positive. In comparison, the coefficients associated with the profitability measure, ROA, are largely negative. Table 7b reports similar regression results where the ratio of retained earnings to total equity (RE/TE) is added to the explanatory variables. Consistent with the notion in DeAngelo et al. (2006), the results in Table 7b indicate that the long-term profitability measure of the earned/contributed capital mix, RE/TE, appear to be more significant than the short-term profitability measure of returns on total assets, ROA. The results indicate that firms paying stock dividends only are associated with higher asset growth rate, but lower long-term profitability as measured by the ratio of retained earnings to total equity.

Table 6a: Multivariate Logistic Regressions For Financial Attributes Between Dividend Payers And Non-Payers

	Intercept	Log(SIZE)	ROA	△TA/TA
1992	5.12	-0.53	0.57	0.00
	(0.60)	(-0.60)	(5.18) **	(0.12)
1993	13.30	-1.33	1.25	-0.03
	(0.47)	(-0.45)	(2.16) *	(-0.41)
1994	-4.59	0.41	0.58	0.01
	(-0.60)	(0.52)	(4.49) **	(0.23)
1995	-7.57	0.71	0.69	0.03
	(-0.92)	(0.82)	(5.56) **	(1.66)
1996	-20.97	2.17	0.57	0.01
	(-2.74) **	(2.74) **	(5.12) **	(0.76)
1997	-8.30	0.83	0.53	0.02
	(-1.32)	(1.29)	(4.92) **	(1.28)
1998	1.81	-0.18	0.50	0.01
	(0.40)	(-0.39)	(7.32) **	(0.77)
1999	-10.77	1.05	0.50	0.01
	(-2.38) *	(2.29) *	(7.70) **	(0.77)
2000	-5.61	0.44	0.58	0.05
	(-1.43)	(1.11)	(8.01) **	(3.51) **
2001	-0.43	-0.08	0.79	0.01
	(-0.13)	(-0.25)	(9.16) **	(0.70)
2002	-2.85	0.20	0.54	0.03
	(-1.01)	(0.69)	(8.87) **	(2.02) *
2003	-4.02	0.30	0.54	0.04
	(-1.43)	(1.06)	(8.71) **	(3.19) **
2004	2.24	-0.32	0.58	0.02
	(0.71)	(-0.97)	(9.34) **	(1.69)
2005	2.50	0.18	0.73	0.01
	(−0.77)	(0.54)	(9.50) **	(0.42)
2006	-9.80	0.95	0.43	0.00
	(-3.40) **	(3.22) **	(9.78) **	(0.21)
2007	-7.73	0.69	0.63	0.01
	(-2.41) *	(2.11) *	(8.69) **	(0.92)
1992-1997	-3.83	0.38	0.70	0.01
	(-0.79)	(0.76)	(6.21) **	(0.62)
1998-2007	-3.97	0.32	0.58	0.02
	(-2.77) *	(2.21)	(16.87) **	(3.84) **
1992-2007	-3.92	0.34	0.63	0.01
	(-2.04)	(1.75)	(13.25) **	(3.00) **

*The table reports regression results that examine firm attributes between dividend payers and non-payers. The dependent variable (Y) is a dummy variable set to one for dividend payers (including cash dividends only, stock dividends only, and a mix of cash and stock dividends) and zero for non-payers. The explanatory variables include the logarithm of total assets (log(SIZE)), return on assets (ROA), and total assets growth rate (△TA/TA). The asterisks * and ** indicate significance of the t-values at the levels of 5 and 1% respectively.*

Table 6b: Multivariate Logistic Regressions for Financial Attributes between Dividend Payers and Non-payers

	Intercept	Log(SIZE)	RE/TE	ROA	△TA/TA
1992	9.67	-1.01	0.20	0.34	0.01
	(1.07)	(-1.06)	(2.81)**	(2.34)*	(0.21)
1993	23.99	-2.42	0.24	1.06	-0.05
	(0.85)	(-0.82)	(1.45)	(1.58)	(-0.46)
1994	4.15	-0.50	0.20	0.36	0.02
	(0.44)	(-0.51)	(2.82)**	(2.13)*	(0.52)
1995	0.73	-0.19	0.17	0.48	0.05
	(0.08)	(-0.21)	(2.80)**	(3.25)**	(2.46)*
1996	-24.60	2.56	0.30	0.19	0.00
	(-2.81)**	(2.81)**	(3.48)**	(1.19)	(0.18)
1997	-5.78	0.57	0.40	0.02	0.04
	(-0.75)	(0.74)	(4.25)**	(0.11)	(2.20)*
1998	1.57	-0.15	0.07	0.37	0.02
	(0.34)	(-0.32)	(2.96)**	(4.88)**	(1.23)
1999	-12.31	1.20	0.24	0.26	0.02
	(-2.30)*	(2.22)*	(5.14)**	(2.81)**	(1.06)
2000	-8.05	0.70	0.24	0.29	0.05
	(-1.83)	(1.58)	(4.64)**	(2.95)**	(2.88)**
2001	-1.42	0.03	0.28	0.48	0.00
	(-0.38)	(0.07)	(5.52)**	(4.75)**	(0.04)
2002	-3.58	0.27	0.17	0.31	0.03
	(-1.14)	(0.85)	(5.84)**	(4.21)**	(2.17)*
2003	-5.86	0.48	0.25	0.27	0.03
	(-1.68)	(1.37)	(6.26)**	(3.47)**	(1.60)
2004	4.39	-0.56	0.20	0.36	0.02
	(1.18)	(-1.46)	(5.58)**	(4.44)**	(1.09)
2005	1.81	-0.26	0.23	0.34	0.01
	(0.48)	(-0.68)	(4.87)**	(3.31)**	(0.73)
2006	-4.80	0.41	0.37	0.07	0.01
	(-1.19)	(0.99)	(6.50)**	(0.83)	(0.35)
2007	0.51	-0.15	0.21	0.60	-0.01
	(0.11)	(-0.34)	(5.43)**	(4.88)**	(-0.59)
1992-1997	1.36	-0.16	0.25	0.41	0.01
	(0.21)	(-0.24)	(7.16)**	(2.81)*	(0.80)
1998-2007	-2.77	0.20	0.23	0.33	0.02
	(-1.71)	(1.19)	(9.36)**	(7.59)**	(3.08)*
1992-2007	-1.22	0.06	0.24	0.36	0.01
	(-0.47)	(0.23)	(12.03)**	(6.17)**	(2.39)

*The table reports regression results that examine firm attributes between dividend payers and non-payers.The dependent variable (Y) is a dummy variable set to one for dividend payers (including cash dividends only, stock dividends only, and a mix of cash and stock dividends) and zero for non-payers. The explanatory variables include the logarithm of total assets (log(SIZE)), retained earnings to equity ratio (RE/TE), return on assets (ROA), and total assets growth rate (△TA/TA). The asterisks * and ** indicate significance of the t-values at the levels of 5 and 1% respectively*

Table 7 a: Multivariate Logistic Regressions for Financial Attributes between Stock-dividend Payers and Cash-dividend Payers

	Intercept	**Log(SIZE)**	**ROA**	**△TA/TA**
1992	-5.09	0.72	-0.01	0.07
	(-0.52)	(0.69)	(-0.14)	(2.15)*
1993	1.01	0.07	-0.03	0.09
	(0.11)	(0.08)	(-0.29)	(2.14)*
1994	5.14	-0.21	-0.13	0.07
	(0.51)	(-0.20)	(-1.41)	(1.67)
1995	2.55	-0.07	-0.08	0.06
	(0.31)	(-0.08)	(-1.13)	(2.12)*
1996	-9.41	1.20	0.05	0.11
	(-0.77)	(0.95)	(0.46)	(2.29)*
1997	-5.27	0.70	0.23	0.01
	(-0.62)	(0.80)	(1.80)	(0.64)
1998	6.98	-0.52	-0.02	0.03
	(1.07)	(-0.80)	(-0.41)	(1.65)
1999	1.01	0.13	-0.23	0.11
	(0.17)	(0.21)	(-2.42)*	(3.29)**
2000	-1.55	0.09	-0.01	0.10
	(-0.31)	(0.17)	(-0.11)	(4.35)**
2001	-1.15	0.08	-0.02	0.05
	(-0.35)	(0.24)	(-0.35)	(2.28)*
2002	-4.50	0.47	-0.31	0.06
	(-1.21)	(1.25)	(-3.51)**	(3.33)**
2003	0.22	-0.06	-0.16	0.04
	(0.05)	(-0.15)	(-2.74)**	(2.53)*
2004	-2.09	0.14	-0.21	0.04
	(-0.40)	(0.26)	(-3.07)**	(2.90)**
2005	4.67	-0.58	-0.34	0.07
	(0.80)	(-0.96)	(-3.56)**	(2.74)**
2006	0.49	-0.27	-0.15	0.03
	(0.07)	(-0.40)	(-1.83)	(1.34)
2007	1.84	-0.32	-0.18	0.02
	(0.35)	(-0.60)	(-2.38)*	(0.96)
1992-1997	-1.84	0.40	0.00	0.07
	(-0.81)	(1.78)	(0.08)	(4.79)**
1998-2007	0.59	-0.08	-0.16	0.06
	(0.56)	(-0.81)	(-4.38)**	(6.04)**
1992-2007	-0.32	0.10	-0.10	0.06
	(-0.30)	(0.82)	(-2.81)*	(7.84)**

*The table reports regression results that examine firm attributes between stock-dividend payers and cash-dividend payers. The dependent variable (Y) is a dummy variable set to one for stock-dividend payers and zero for cash-dividend payers. The explanatory variables include the logarithm of total assets (log(SIZE)), return on assets (ROA), and total assets growth rate (△TA/TA). The asterisks * and ** indicate significance of the t-values at the levels of 5 and 1% respectively.*

Table 8 reports the dollar amount of cash dividends and stock dividends for firms classified by both the listing time and industry. Panel A reports the difference in the dollar amount of dividends between the originally-listed firms and the newly-listed firms.

Table 7 b: Multivariate Logistic Regressions for Financial Attributes between Stock-dividend Payers and Cash-dividend Payers

	Intercept	Log(SIZE)	RE/TE	ROA	△TA/TA
1992	-5.38	0.74	0.05	-0.10	0.08
	(-0.55)	(0.72)	(0.57)	(-0.57)	(2.18)*
1993	2.01	-0.03	0.07	-0.14	0.08
	(0.21)	(-0.03)	(0.90)	(-0.85)	(2.11)*
1994	7.93	-0.51	0.17	-0.38	0.07
	(0.70)	(-0.43)	(1.38)	(-1.77)	(1.70)
1995	1.97	-0.03	0.03	-0.12	0.07
	(0.24)	(-0.04)	(0.70)	(-1.30)	(2.16)*
1996	-9.49	1.22	-0.02	0.07	0.11
	(-0.77)	(0.95)	(-0.26)	(0.52)	(2.28)*
1997	-8.87	1.16	-0.24	0.61	-0.00
	(-0.88)	(1.12)	(-3.43)**	(3.25)**	(-0.08)
1998	6.89	-0.49	-0.10	0.15	0.03
	(1.00)	(-0.72)	(-2.10)*	(1.30)	(1.44)
1999	2.34	0.03	-0.09	-0.12	0.11
	(0.37)	(0.04)	(-2.23)*	(-1.04)	(3.21)**
2000	0.52	-0.11	-0.08	0.10	0.09
	(0.10)	(-0.21)	(-1.85)	(1.07)	(4.20)**
2001	-1.15	0.11	-0.10	0.12	0.05
	(-0.33)	(0.30)	(-2.41)*	(1.59)	(2.27)*
2002	-3.48	0.40	-0.16	-0.08	0.07
	(-0.91)	(1.04)	(-2.80)**	(-0.72)	(3.22)**
2003	1.37	-0.15	-0.12	-0.01	0.05
	(0.34)	(-0.37)	(-2.39)*	(-0.15)	(2.71)**
2004	-0.77	0.04	-0.09	-0.10	0.04
	(-0.15)	(0.07)	(-1.72)	(-1.07)	(2.93)**
2005	3.83	-0.47	-0.09	-0.20	0.08
	(0.64)	(-0.76)	(-1.39)	(-1.51)	(2.80)**
2006	0.16	-0.20	-0.06	-0.09	0.02
	(0.02)	(-0.29)	(-1.01)	(-0.84)	(1.18)
2007	0.25	-0.13	-0.08	-0.05	0.02
	(0.05)	(-0.25)	(-2.09)*	(-0.56)	(0.74)
1992-1997	-1.97	0.43	0.01	-0.01	0.07
	(-0.69)	(1.46)	(0.19)	(-0.06)	(4.39)**
1998-2007	1.00	-0.10	-0.10	-0.03	0.06
	(1.10)	(-1.17)	(-11.47)**	(-0.80)	(5.76)**
1992-2007	-0.12	0.10	-0.06	-0.02	0.06
	(-0.10)	(0.74)	(-2.29)	(-0.39)	(7.37)**

*The table reports regression results that examine firm attributes between stock-dividend payers and cash-dividend payers. The dependent variable (Y) is a dummy variable set to one for stock-dividend payers and zero for cash-dividend payers. The explanatory variables include the logarithm of total assets (log(SIZE)), retained earnings to equity ratio (RE/TE), return on assets (ROA), and total assets growth rate (△TA/TA). The asterisks * and ** indicate significance of the t-values at the levels of 5 and 1% respectively.*

The results indicate a significant increase in the dollar amount of cash dividends in the first sub-period than that in the second sub-period for both the originally listed firms as well as the newly listed firms. For the originally listed firms, the cash dividend increases from NT$0.27 per share in the first sub-period to NT$0.49 in the second sub-period. For the newly listed firms, the cash dividend increases by a much larger proportion from NT$0.19 in the first sub-period to NT$0.89 per share in the second sub-period. In comparison, the dollar amount of stock dividends in the first sub-period is much lower than that in the second sub-period for both the originally listed firms as well as the newly listed firms. For originally listed firms, the stock dividend decreases from NT$1.03 in the first sub-period to NT$0.22 per share in the second sub-period. For newly-listed firms, the stock dividend decreases from NT$1.61 in the first sub-period to NT$0.49 in the second sub-period. When newly-listed firms and originally-listed firms are compared, the difference indicates that newly-listed firms distribute more cash dividends than originally-listed firms in the second sub-period, than in the first sub-period. Similarly, newly listed firms distribute more stock dividends than originally-listed firms in the second sub-period.

Table 8: The Dollar Amount of Cash Dividends and Stock Dividends for Firms Classified by Both the Listing Time and Industry

Panel A								
	Originally-listed firms Panel A (1)				**Newly-listed firms (2)**			
	Observations	Cash Dividends	Stock dividends	Stock dividend ratio	Observations	Cash Dividends	Stock dividends	Stock dividend ratio
1992-1999	1137	0.27	1.03	78.61	679	0.19	1.61	88.84
2000-2007	1164	0.49	0.22	33.95	3051	0.89	0.49	38.37
1992-2007	2301	0.38	0.62	56.28	3730	0.57	1.01	61.92
Panel B								
	Non-high-tech firms (4)				**High-Tech firms (5)**			
1992-1999	1498	0.27	1.04	78.87	318	0.17	1.97	91.53
2000-2007	2445	0.66	0.25	30.66	1770	0.96	0.69	42.93
1992-2007	3943	0.46	0.64	54.76	2088	0.56	1.33	67.23
Panel C								
	Difference between newly-listed firms and originally-listed firms (3) = (2)-(1)				**Difference between high-tech firms and non-high-tech firms (6) = (5)-(4)**			
1992-1999		-0.08	0.58	10.23		−0.10	0.93	12.66
2000-2007		0.40	0.27	4.42		0.30	0.44	12.27
1992-2007		0.19	0.39	5.64		0.10	0.69	12.47

The table reports the dollar amount of cash dividends and stock dividends for originally-listed firms versus newly-listed firms (Panel A), and for high-tech firms versus non-high-tech firms (Panel B). Panel C represents the difference between originally-listed firms versus newly-listed firms and high-tech firms versus non-high-tech firms

Table 9 examines firm attributes between newly-listed firms and originally-listed firms, and between high-tech sample firms and non-high-tech sample firms. Panel A1 reports firm attributes between newly-listed firms and originally-listed firms via multivariate logistic regressions. The dependent variable is a dummy variable set to one for newly-listed firms and zero for originally-listed firms. As expected, the results indicate that newly-listed firms are associated with smaller firm size, SIZE, but higher asset growth rate, △TA/TA, and higher return on total assets, ROA. When the retained earnings ratio, RE/TE, is added into explanatory variables, Panel A2 of Table 9 indicates that only the asset growth variable, △TA/TA, remains significantly positive in both sub-periods. Panel B1 reports firm attributes between high-tech and non-high-tech sample firms. Similarly, the results indicate that high-tech firms are associated with significantly higher asset growth rate, △TA/TA, and higher profitability, ROA. When the retained earnings ratio is added, Panel B2 indicates that only the asset growth rate remains significantly positive. The above empirical results indicate that firms listed on the Taiwan Stock Exchange are associated with higher stock dividend payments in the first sub-period (1992-1997) than in the second sub-period (1998-2007). The trend of lower stock dividends appears to reflect the lower growth rate for the sample firms in the sample period 1992-2007. The results are consistent with the prediction of the life cycle hypothesis of dividend payments as suggested in Fama and French (2001) and DeAngelo et al (2006). However, Baker and Wurgler (2004a, b) suggest an alternative explanation in that firms adjust their dividend policy to cater to the market demand. They point out that firms distribute more dividends as the dividend premium is higher. That is, firms set their dividends according to the premium paid by the investors. Thus, future research regarding to the changing pattern of dividend payments could examine this hypothesis. It is likely that the catering theory may provide further insight into the practice of dividend payments.

Table 9: Firm Attributes between Newly-listed and Originally-listed Firms, and between High-tech and Non-high-tech Firms

	Intercept	Log(SIZE)	RE/TE	ROA	△TA/TA
Panel A 1:	**Firm Attributes between Newly-Listed Firms and Originally-Listed Firms (Three Explanatory Variables)**				
1992-1999	13.62	−1.53		0.03	0.03
	(7.41)**	(−7.15)**		(4.14)**	(7.80)**
2000-2007	12.65	−1.22		0.04	0.02
	(29.90)**	(−24.82)**		(5.35)**	(3.55)**
1992-2007	13.11	−1.36		0.03	0.03
	(15.24)**	(−12.68)**		(6.87)**	(6.76)**
Panel A 2:	**Firm Attributes between Newly-Listed Firms and Originally-Listed Firms (Four Explanatory Variables)**				
1992-1999	14.88	−1.67	0.04	−0.04	0.03
	(6.81)**	(−6.52)**	(3.19)**	(−2.22)	(8.39)**
2000-2007	12.98	−1.25	0.00	0.03	0.02
	(37.57)**	(−29.43)**	(0.88)	(3.57)**	(3.38)**
1992-2007	13.87	−1.44	0.02	−0.00	0.03
	(13.53)**	(−11.15)**	(2.60)*	(−0.12)	(6.66)**
Panel B 1:	**Firm Attributes between High-Tech and Non-High Tech Firms (Three Explanatory Variables)**				
1992-1999	−0.85	−0.21		0.08	0.03
	(−0.44)	(−1.02)		(3.75)**	(4.07)**
2000-2007	−1.28	0.05		0.03	0.03
	(−3.09)*	(2.12)		(2.21)	(3.08)*
1992-2007	−1.06	−0.08		0.05	0.03
	(−1.11)	(−0.74)		(3.93)**	(5.11)**
Panel B 2:	**Firm Attributes Between High-Tech and Non-High Tech Firms (Four Explanatory Variables)**				
1992-1999	−0.89	−0.21	0.00	0.08	0.03
	(−0.43)	(−0.97)	(0.13)	(1.89)	(4.27)**
2000-2007	−1.10	0.04	0.00	0.03	0.03
	(−2.84)*	(1.75)	(0.08)	(1.17)	(2.99)*
1992-2007	−1.00	−0.09	0.00	0.05	0.03
	(−0.99)	(−0.80)	(0.16)	(2.20)*	(5.12)**

*Panel A examines firm attributes between newly-listed and originally-listed firms. The dependent variable is a dummy variable set to one for newly-listed firms and zero for originally-listed firms. Panel B examines firm attributes between high tech firms and non-high-tech firms. The dependent variable is a dummy variable set to one for high-tech firms and zero for non-high-tech firms. The explanatory variables include logarithm of total assets (log(SIZE)), the ratio of retained earnings to total equity (RE/TE), return on total assets (ROA), and total asset growth ratio (△TA/TA). The asterisks * and ** indicate significance of the t-values at the levels of 5 and 1% respectively.*

CONCLUSION

This paper examines the dividend policy for firms listed on the Taiwan Stock Exchange and test the life cycle hypothesis. The sample involves 6031 observations of dividend payments over the 16-year period 1992-2007. The results indicate that the dividend-paying types of publicly traded firms change with the firm characteristics. The dividend payers (cash dividends, stock dividends, or both) are associated with higher profitability, higher asset growth rate, and higher market-to-book ratio than non-payers (none dividends). Consistent with the prediction of life cycle hypothesis, the firms have propensity to pay different types of dividend payments in the different life cycle stages. The results indicate that stock-dividend payers are associated with higher asset growth rate, but lower ratio of retained earnings to total equity than those for cash-dividend payers. In particular, stock-dividend payers are associated with higher asset growth rate and lower return on assets, lower retained to total equity ratio than those for cash-dividend payers. These results are consistent with the life cycle hypothesis of dividend payment in that younger firms with higher growth potential but lower profitability tend to distribute more stock dividends than cash dividends. When firms become more mature as characterized by lower growth potential but higher profitability tend to distribute more cash dividends as opposed to stock dividends

REFERENCES

Baker, M. and J. Wurgler (2004a), "A catering theory of dividends, "Journal of Finance, vol. 59, p.1125-1165.

Baker, M. and J. Wurgler (2004b), "Appearing and disappearing dividends: the link to catering incentives," Journal of Financial Economics, vol. 73, p.271-288.

Brav, a., J. Graham, C. Harvey and R. Michaely (2005), "Payout policy in the 21st century," Journal of Financial Economics, vol. 77, p. 483-527.

Bulan, L., N. Subramanian and L. Tanlu (2007), "On the timing of dividend initiations," Financial Management, Winter, p. 31-65.

Chang, R. P. and G. S. Rhee (1990), "The impact of personal taxes on corporate dividend policy and capital structure decisions," Financial Management, vol. 19, p. 21-31.

Crawford, D., D.R. Franz and G.J. Lobo (2005), "Signaling managerial optimism through stock dividends and stock splits: A re-examination of the retained earnings hypothesis," Journal of Financial Quantitative Analysis, vol. 40, p. 531-61.

DeAngelo, H. and L.E. DeAngelo (2006), "The irrelevance of the MM dividend irrelevance theorem," Journal of Financial Economics, vol. 79, p. 293-315.

DeAngelo, H., L.E. DeAngelo and R.M. Stulz. (2006), "Dividend policy and the earned/contributed capital mix: a test of the lifecycle theory," Journal of Financial Economics, vol. 81, p. 227–54.

Denis, D. and, I. Osobov (2008), "Why do firms pay dividends? International evidence on the determinants of dividend policy." Journal of Financial Economics, vol. 89, p.62–82.

Easterbrook, F. (1984), "Two agency-cost explanations of dividends," American Economic Review, vol. 74, p. 650-59.

Eisemann, P.C. and E.A. Moses (1978), "Stock dividends: Management's view," Financial Analysts Journal, vol. 34, p. 77-85.

Fama, E.F. and K.R. French (2001), "Disappearing dividends: changing firm characteristics or lower propensity to pay," Journal of Financial Economics, vol. 60, p. 3–43.

Gaver, J. and K. Gaver (1993), "Additional evidence on the association between the investment opportunity set and corporate financing, dividend and compensation policies," Journal of Accounting and Economics, vol. 16, January–July, p.125–60.

Grullon, G., R. Michaely and B. Swaminathan (2002), "Are dividend changes a sign of firm maturity," Journal of Business, vol. 75, p. 387–424.

Herberg, G., N.R. Prabhala (2009), “Disappearing Dividends, Catering and Risk,”Review of financial studies, vol. 22, p. 79-116.

Jensen, G.R., D.P. Solberg and T.S. Zorn (1992), “Simultaneous determination of insider ownership, debt and dividend policy,” Journal of Financial and Quantitative Analysis, vol. 27, p. 247-63.

Jensen, M.C. (1986), “Agency costs of free cash flow, Corporate Finance and Takeovers,” American Economic Review, vol. 76, p. 323-29.

John, K. and J. Williams (1985), “Dividends, dilution, and taxes: A signaling equilibrium,” Journal of Finance, vol. 40, September, p. 1053–70.

Kato, H.K. and W. Tsay (2002), “Are stock dividends (MUSHOs) melons or lemons in Japan,” Pacific-Basin Finance Journal, vol. 10, p. 531-48.

Miller, M. and F. Modigliani (1961), “Dividend policy: growth and the valuation of Shares,” Journal of Business, vol. 34, p. 411-33.

Miller, M. H. and K. Rock (1985), “Dividend policy under asymmetric information,” Journal of Finance, vol. 40, September, p. 1031–51.

Myers, S.C. and N. Majluf (1984), “Stock issues and investment policy when firms have information that investors do not have,” Journal of Financial Economics, vol. 13, p. 187-221.

Smith, C. and R. Watts (1992), “The investment opportunity set and corporate financing, dividend and compensation policies,” Journal of Financial Economics, vol. 32, December, p. 263–92.

Trong, T. and R. Heaney (2007), “Largest shareholder and dividend policy around the world,” The Quarterly of Economics and Finance, vol. 47, p. 667-87.

BIOGRAPHY

Ming-Hui Wang, Graduate Institute of Finance, National Taiwan University of Science and Technology, 43, Sec.4, Keelung Rd., Taipei, 106, Taiwan, R.O.C.
E-mail: D9418003@ntust.edu.tw

Mei-Chu Ke, Department of Industrial Engineering and Management, National Chin-Yi University of Technology, 35, Lane 215, Section 1,Chung-Shan Road, Taiping City, Taichung County, 411, Taiwan, R.O.C. E-mail: kemc@ncut.edu.tw

Day-Yang Liu, Graduate Institute of Finance, National Taiwan University of Science and Technology, 43, Sec.4, Keelung Rd., Taipei, 106, Taiwan, R.O.C.
E-mail: LIUDY@ntust.edu.tw

Yen-Sheng Huang, Department of Business and Management, Ming Chi University of Technology, 84, Gungjuan Rd., Taishan, Taipei, 24301, Taiwan, R.O.C.
E-mail: yshuang@mail.mcut.edu.tw

THE IMPACT OF FINANCIAL SECTOR REFORMS ON BANKS PERFORMANCE IN NIGERIA

Olubayo Thomas Olajide, Lagos State University
Taiwo Asaolu, Obafemi Awolowo University
Charles Ayodele Jegede, Lagos State University

ABSTRACT

This study examined the impact of financial reforms on banks' organizational performance in Nigeria between 1995 and 2004. It specifically determined the effects of policies of interest rates deregulation, exchange rate reforms and bank recapitalization on banks performance, and analyzed how banks internal characteristics and industry structure affect the performance of Nigerian banks. The study utilized panel data econometrics in a pooled regression, where time-series and cross-sectional observations were combined and estimated. The result of econometric panel regression analysis confirmed that the effects of government policy reforms, bank specific characteristics and industry structure has mixed effects on banks profitability level and net interest margin of Nigerian banks. Bank specific characteristics appear to have significant positive influence on bank's profitability and efficiency level, while industry stricture variables appeared not to have contributed meaningfully to the profitability and efficiency performance of banks in Nigeria

.

JEL: Nigeria, Financial Reforms, Banks Performance

KEYWORDS: F2; G21; E1

INTRODUCTION

Roles of bank in the economic process are strategic. It represents the heart of the national economic life and the nucleus of the economic survival around which other sectors are tangential. The centrality of the banking sector also makes the sector to attract much attention in any reform process. Therefore, the adoption of the Structural Adjustment Programme (SAP) in Nigeria in 1986 made the banks the centre of the gamut of the reform in the financial sector.

Among the objectives of financial reforms is to build more efficient, robust and deeper financial systems, which can support the growth of private sector enterprises (Ajilore 2003). The proponents of financial reforms argued that such reform would bring about significant economic benefits through improved bank operational efficiency and effectiveness in order to guarantee a more effective mobilization and efficient allocation of resources among various economic units. Whether or not bank actually achieves these expected performance gains, remain critically an empirical question. If reforms do in fact, lead to efficiency gains, then shareholder wealth could be increased. On the other hand, if reforms do not lead to the promised positive effects, then reforms may lead to a less profitable and valuable banking industry.

A reading of the literature suggests that the efficiency gains that alleged to accrue to the large and growing wave of banking reforms have not been verified. More importantly, signals from the apex bank (CBN) indicated that three out of the remaining 25 banks after the recent reform are technically distressed. Thus, leading the research community in quandary on whether the industry has followed a path of massive restructuring on a misguided belief of efficiency gains or whether the financial regulators and operators are lying to the public and shareholders about the effects of their activity on banking performance. It is important to address this issue by reconciling data with empirical reality of continued reform activity in the Nigerian banking sector.

Moreover, while there are myriads of studies on the effects of reform policy on other sectors of the Nigerian economies, there is paucity of studies on the effects of bank reforms on banking performance itself in Nigeria. The neglect of this issue is particularly surprising for this sector of Nigerian economy, where the short run real effects of financial reforms have long remained controversial. In addition, the adoption of financial reforms has often been postponed, reversed shortly after being implemented or partially implemented for fear of recessionary consequences. Indeed, ascertaining the empirical relevance of the implications of bank reform on banking operating efficiency for developing economies is an important step in assessing the short run costs of overall economic reforms in these economies. More so, reforms in the banking sector affect not only the bankers and their customers, it has pervasive impact on overall economic activity given the centrality of financial system in the growth process. It is of great importance to know if bank reforms actually delivered its benefits to the economy.

More importantly, there is evidence in the literature that financial reforms in Nigeria have affected negatively on the overall performance of Nigerian banking system (Ajilore, 2003, CBN 2004, 2006). The implication of this evidence on banking system for a fragile and weak financial system in Nigeria is far reaching. First, unguided financial liberalization exposes the banks and indeed the economy to excessive financial shocks. The recent financial crises in the Asian countries are a case in point. Second, continuous reforming the financial system makes the system unstable, planning difficult and indeed creates unfriendly operational environment that may affect the efficient operational performance of the banks. For instance, the ripples of universal banking introduced in 2001 have not settled before the recapitalization exercise was introduced in 2004. Similar reversal and rewriting of rules were noticed in the past reforms. Given the under developed nature of financial base of the economy and the dominant role the bank is expected to play in the transition stage of development, the issue deserves attention; specific bank empirical evidence is crucial if any policy inference is to be made based on policy reform bank performance hypothesis.

Establishing or refuting the validity of positive effects of reforms on banks performance without taking cognizance of the 'aggregate versus specific bank level' controversy impedes seriously the policy relevance of the inferences from such studies. However, some studies had attempted to examine the effects of financial reforms on banks in other developed country like Japan. Not much work has been done in this area to investigate individual bank effect of financial sector reforms in a developing economy like Nigeria. Investigating micro effects of bank reforms in Nigeria is a worthwhile challenge, which will distinguish this study from any other studies carried out on policy reform- bank performance nexus in any developing countries like Nigeria.

Filling these empirical gaps is an invaluable addition to existing empirical evidence on the financial management and economics using Nigerian-banking industry as the case study. This is therefore an exigent scholarship effort at contributing to, and complementing other scholarly efforts at providing empirical foundation for designing appropriate policy strategy to promote and sustain financial development growth in a developing economy like Nigeria. To this extent, this study investigated the empirical linkage between financial reforms and banks' operational performance in Nigeria. Specifically, it investigated whether financial reforms have any effect on the operational performance of banks in Nigeria.

The rest of the paper proceeds as follows: following this introductory section, section 2 presents the review of extant literature in the study area. Section 3 presents data Sources, sampling procedure and modeling techniques for the subsequent empirical analysis contained in this study; section 4 presents the empirical estimation and analysis of results, while section 5 concludes with summary, conclusion and policy recommendations.

REVIEW OF EMPIRICAL LITERATURE

There exist many studies carried out to examine the relationship between financial sector reforms and bank performance. Demirguc–Kunt and Detragiache (1998) conducted a study in 53 countries for the period of (1980-1995), on financial liberalization and financial fragility. Their findings showed that a weak institutional environment makes liberalization more likely to lead to banking crises, specifically in countries where the rule of law is weak, corruption is widespread, the bureaucracy is inefficient and contract enforcement mechanisms are ineffective.

McKinnon (1973) in his study discovered that liberalized financial systems experience high volatility of nominal interest rates in comparison to controlled ones and especially more so if financial liberalization preceded economic stabilization. Consequently, banks are exposed to a greater risk and are therefore more vulnerable in the process of performing their financial intermediation functions. He argued further that banks develop more interest in adopting high-risk loan portfolio because of the liberalization exercise. This is because the entry of more banks into the industry erodes the monopolistic profit as competition intensifies thereby reducing the cost of losing a banking license when a bank becomes insolvent. In Kharkate (1992) and Sundararajan and Balino (1991), it was established that increased freedom of entry into the financial sector resulted in indiscriminate bidding for funds which can raise interest rates to exceedingly high levels.

The study by Chete (2002), on financial liberalization, development and fragility drew from the model used by Dermiguc – Kunt and Detragiche (1998). It also confirmed the result obtained by Dermiguc-Kunt and Detragiache that there is positive correlation between the financial liberalization dummy and the probability of a banking crisis, which gives credence to the hypothesis that financial liberalization is a cause of banking sector fragility.

Burkett and Vogel (1992) extended Mckinnon's complementarily hypothesis" to the case where a credit constrained firm uses non-capital asset balances (cash, bank, deposits and inflection hedges) as working capital, and where the firm's credit constraint is loosened by increased deposit holdings. The model concludes that in such an environment, interest rate liberalization would lead to more productive utilization of the capital stock and additional credit –supply effects emphasized by McKinnon (1973) and Shaw (1973).

Fischer and Smaoui (1997) conducted a study using a sample of 82 banks from Greece, Indonesia, Korea, Malaysia, Mexico, Thailand and Taiwan to identify the characteristics of banks that are most likely to cause banking crisis following financial liberalization. To accomplish this objective the authors identify a sample of "failed" and "healthy" banks following financial liberalization and then compared their financial data at the onset of the process. The study also tried to identify to what extent the quality of the loan portfolio and the management and risk-taking practices of banks affect the outcome. The results suggest that banks that are more conservative or are more capable of absorbing important macro shocks given their capitalization, are the ones that are more likely to remain solvent. The study of Chang and Velasco (1998) also confirmed that banks become vulnerable to exogenous shocks and shifts in expectations after financial liberalization.

In the study carried out by Ikhide and Alawode (2001), evidence from Nigeria showed that the success or failure of a financial sector reform programme depends on, among other factors, the implementation of an appropriate sequence of the various policies in the programme package. The study showed that high bank insolvency, high inflation and excessively high interest rates have become common phenomena in the economy because of financial sector reforms embarked upon. The study uses discriminate analysis to demonstrate that the health of banks deteriorates following reforms in Nigeria.

DATA SOURCES, SAMPLING PROCEDURE AND MODELING TECHNIQUES

This study utilized data on identified banks for the periods 1986 to 2004. These data are coalesced together to generate a pooled data series. Hence the study is both time series and cross sectional. Secondary time series data were collected on the selected banks for the period 1995 and 2004. The sample were drawn from all the 51 banks in existence, and listed on the Nigerian Stock Exchange between these two (1995 to 2004) years. Data were sourced from the annual returns of these banks to Central bank of Nigeria (CBN), and FACTBOOK of Statistics published by the Nigerian Stock Exchange (NSE).

The empirical test is concerned with determining the impact of banking sector reforms on organizational performance in Nigerian commercial banks. For the purpose two categories of performance measures are explored, these are the net interest margin (NIM) and the return on assets (ROA). In addition, three classes of explanatory factors are considered; these are banking reform indicators, financial structure indicators and banks' internal characteristics indicators. A linear equation relating the performance measures to a variety of indicators is displayed in equation 1:

$$I_{it} = c + \sum_{j=1}^{J} \beta_j X_{it}^{j} + \sum_{l=1}^{L} \beta_l X_t^{l} + \sum_{m=1}^{M} \beta_m X_t^{m} + \varepsilon_{it} \qquad (1)$$

$$\varepsilon_{it} = v_i + u_{it}$$

where I_{it} represents two alternative performance measures of bank *i* at time *t*, with $i = 1,\ldots,N$; $t = 1,\ldots, T$; c is a constant term, the *X*s are explanatory variables (grouped into financial reforms variables, bank internal variables and measures of financial structure indicators. *j*, *l* and *m* respectively) and ε_{it} is the disturbance, with v_i capturing the unobserved bank-specific effect and *uit* the idiosyncratic error. Although the primary focus of this study is the relationship between financial reforms and banks performance, the inclusion of banks internal variables and financial structure indicators is intended to control for cyclical factors that might affect bank performance in Nigeria.

Two measures of performance are used in the study: the net interest margin (NIM) and the return on assets (ROA). The NIM variable is defined as the net interest income divided by total assets. ROA is a ratio computed by dividing the net income over total assets. NIM and ROA have been used in most banks' performance studies. ROA measures the profit earned per naira of assets and reflects how well bank management uses the bank's real investments resources to generate profits while NIM is focused on the profit earned on interest generating activities.

Three indicators of banking sector reforms are considered in our analysis. These are number of banks (NBANK), real interest rate (RIR) and nominal effective exchange rate indices (EXR). The three variables respectively captured the impact of financial/banking sector reforms on performance of Nigerian banks. This choice is informed by the fact that banking reforms during our period of analysis can be categorized under three headings namely;

i) Reform of the financial structure: Generally, policy instruments here are designed to increase competition, strengthen the supervisory roles of the regulatory authorities and strengthen public sector relationship with the financial sector. Measures undertaken here include granting of licenses to more banks, strengthening supervision of banks and a clear definition of the roles of the financial sector.
ii) Monetary policy reforms: These are policies designed to stabilize the economy in the short run and to induce the emergence of a market-oriented financial sector. Such included rationalization of credit controls, deregulation of interest rates and a shift from direct to indirect system of monetary control.
iii) Foreign exchange reforms: previously, the sale and purchase of foreign exchange was rigidly controlled using import licenses and the exchange rate was fixed by fiat. This resulted in an overvaluation of the naira with its attendant consequences. In order to restore appropriate exchange rates, the authorities began the auction sales of foreign exchange to licensed dealers.

Three bank's characteristics indicators are used as internal determinants of performance. They comprise the ratio of equity capital to total assets (CAP), the ratio of bank's loans to total assets (BLOAN), and the log of bank assets (LNSIZE). Bank loans are expected to be the main source of income and are expected to have a positive impact on bank performance. Other things constant, the more deposits are transformed into loans, the higher the interest margin and profits. However, if a bank needs to increase risk to have a higher loan-to-asset ratio, then profits may decrease. We also expect that the higher the equity-to-asset ratio, the lower the need for external funding and therefore higher performance. It is also a sign that well capitalized bank face lower costs of going bankrupt and then cost of funding is reduced. The size of the bank is also included as an independent variable to account for size related economies and diseconomies of scale. In most of the finance literatures, the total assets of the banks are used as a proxy for bank size. However, since the other dependent variables in the models such as ROA were deflated by total assets it would be appropriate to log total assets before including it in the models.

The financial structure indicators serve to examine how the performance of the banking sector is related to the relative development of the banks and stock markets. Relative size (RSIZE) is calculated as the ratio of the stock market capitalization to total assets of deposit money banks. In addition, we use stock market capitalization divided by GDP (MCAP) as a proxy of financial market development and as a measure of the size of the equity market. The size of the banking sector (SBS) is measured by the ratio of total assets of the deposit banks to GDP and is intended to measure the importance of bank financing in the economy. MCAP and SBS may also indicate the complementarities or substitutability between bank and equity market financing. Both variables are expected to influence positively bank performance. Following from the foregoing discussion, the estimated form of equation 1 takes the form:

$$I_t = \beta_o + \beta_1 NBANK_t + \beta_2 RIR_t + \beta_3 EXR_t + \beta_4\, CAP_t + \beta_5 BLOAN_{\,t} + \beta_6 LNSIZE_t + \beta_7\, RSIZE_{\,t} + \beta_8\, MCAP + \beta_9 SBS + \varepsilon_t \qquad (2)$$

where:

I_t = commercial bank performance indicator measured by net interest margin (NIM) and return on assets (ROA)

NBANK = Number of Banks ($\beta_1 > 0$)

RIR = Real Interest Rate ($\beta_2 < 0$)

EXR = Real Exchange Rate ($\beta_3 > 0$)

CAP = the ratio of equity capital to total assets ($\beta_4 > 0$)

BLOAN = the ratio of bank's loans to total assets ($\beta_5 > 0$)

LNSIZE = log of bank assets (($\beta_6 > 0$)

RSIZE = the ratio of the stock market capitalization to total assets of deposit money banks ($\beta_7 > 0$)

MCAP = stock market capitalization divided by GDP ($\beta_8 > 0$)

SBS = the ratio of total assets of the deposit money banks to GDP ($\beta_9 > 0$)
ε_t = *error term*

EMPIRICAL ESTIMATION AND ANALYSIS OF RESULTS

This section employs panel least square estimation techniques to estimate the impact of financial sector reforms on organizational performance in Nigerian banking system. Section 4.1 begins with the investigation of the time series properties of the data set in our systems of equations, this is done by carrying out a unit root and cointegration tests on variables of the empirical model, while section 4.2 presents results from model estimation.

Panel Unit Root And Cointegration Results

Before estimating the equations, an examination of the properties of the underlying data was effected. Testing for stationarity of the time series was done to ensure that the variables used in the regressions were not subject to spurious correlation. For the variables like INSIZE, MCAP, RIR RSIZE and SBS the results indicated no presence of a unit root. The unit root test results on the variable ROA, NIM, CAP and NBANK, BLOAN, REXCH generally indicated the presence of a unit root. Going by most of the results, the variables were transformed by differencing. The unit root test for the transformed variables confirmed that they were stationary. Table 1 shows the test results.

Table 1: Panel Unit Root Tests- (Individual Effects, Individual Linear Trends)

		Methods							
		1		2		3		4	
VARIABLES		LLC	P-VALUE	IPS	P-VALUE	ADF	P-VALUE	PP	P-VALUE
NIM	0	2.74	0.10	-4.32	0.11	32.89	0.10	82.13	0.00
	1	-11.64	0.00	-0.95	0.17	22.89	0.01	74.52	0.00
	2	-10.86	0.00	-6.31	0.00	37.64	0.00	91.09	0.00
ROA	0	-729.69	0.00	-165.21	0.00	552.62	0.00	476.79	0.00
	1	-4.62	0.00	2.16	0.98	12.72	0.00	11.12	0.00
	2	-12.36	0.00	-0.50	0.30	68.47	0.21	120.74	0.00
BLOAN	0	-12.32	0.00	-1.9	0.00	38.25	0.37	69.57	0.11
	1	-11.64	0.00	0.37	0.64	15.52	0.63	89.82	0.00
	2	-10.7	0.00	-0.95	0.17	21.66	0.04	116.22	0.00
CAP	0	-4.78	0.00	0.41	0.66	27.51	0.38	70.45	0.00
	1	-13.84	0.00	-0.73	0.23	64.57	0.00	117.07	0.00
	2	9.9E-14	0.50	-1.67	0.05	60.35	0.00	115.54	0.00
INSIZE	0	-203.17	0.00	-19.69	0.00	50.35	0.08	114.30	0.00
	1	-80.29	0.00	-6.84	0.00	66.00	0.00	185.01	0.00
	2	-20.31	0.00	-2.15	0.02	62.31	0.00	194.86	0.00
MCAP	0	-1522.7	0.00	-424.70	0.00	552.62	0.00	173.28	0.00
	1	-729.69	0.00	-165.21	0.00	552.62	0.00	476.79	0.00
NBANKS	0	-4.62	0.00	2.16	0.98	12.72	0.00	11.12	0.00
	1	-24.43	0.00	-2.99	0.00	152.29	0.00	277.65	0.00
REXCH	0	-5.30	0.00	0.07	0.53	53.64	0.71	52.27	0.75
	1	-12.36	0.00	-0.50	0.30	68.47	0.21	120.74	0.00
	2	-11.30	0.00	0.33	0.63	52.36	0.75	280.08	0.00
RIR	0	-31.26	0.00	-6.52	0.00	245.3	0.00	159.43	0.00
RSIZE	0	-8.6	0.00	-7.2	0.00	48.86	0.00	64.49	0.00
	1	-2.61	0.00	-9.32	0.21	32.78	0.02	72.26	0.00
SBS	0	1.71	0.97	-19.4	0.53	51.13	0.01	45.21	0.59

Notes: Table 1 presents the results of unit roots tests of variables of the model. Panels 1 to 4 respectively indicates results from the Levin, Lin and Chu (LLC), Im, Pesaran and Shin (IPS), Augmented Dickey Fuller (ADF) and Phillips Peron (PP) test statistics. The null hypothesis (H_o) is that there is no unit root, (H_1) some do have a unit process. 0, 1 and 2 represent level, first difference and second difference respectively.

One of the ways to deal with I (1) variables is to investigate the cointegration relationship among variables. The Pedroni panel cointegration test was conducted. Except for panel variance and panel ADF statistics, all of the panel cointegration test statistics developed by Pedroni rejects the null of no cointegration at 5 percentage significance level (see Table 2). Since there is a cointegration relationship between the variables, the Engle and Granger two-step method can be used. According to Engle and Granger (1987), if the variables are cointegrated, the stable long-run relationship can be estimated by standard least-squares techniques.

Table 2: Pedroni Residual Cointegration Test

Series: Nim Roa Bloan Cap Insize Mcap Nbanks Rexch Rir Rsize Sbs				
Lag selection: Automatic SIC with max lag of 0 to 1				
Newey-West bandwidth selection with Bartlett kernel				
Alternative hypothesis: common AR coefs. (within-dimension)				
			Weighted	
	Statistic	**Prob.**	**Statistic**	**Prob.**
Panel v-Statistic	0.2775	0.3839	0.0504	0.3984
Panel rho-Statistic	1.7949	0.0797*	1.7999	0.0790*
Panel PP-Statistic	-5.0714	0.0000***	-5.3626	0.0000***
Panel ADF-Statistic	-3.3926	0.0013***	-3.6654	0.0005***
Alternative hypothesis: individual AR coefs. (between-dimension)				
	Statistic	Prob.		
Group rho-Statistic	2.5737	0.0145		
Group PP-Statistic	-6.0173	0.0000		
Group ADF-Statistic	-3.8703	0.0002		

*This table shows the Pedroni Residual Cointegration test results. ***, ** and * indicate significance at the one, five and ten percent levels respectively*

Financial Liberalization And Bank Performance: Results From Panel Data Analysis

In what follows, we present the result from panel data estimation of the effects of financial liberalization policy and other control variables on two alternative measures of bank performance; viz: Returns on Assets (ROA). This is a general measure of profitability of banking operations in the industry, and the Net Interest Margin (NIM), which serves to capture the extent of efficiency of financial intermediation roles of Nigerian banks.

The generally accepted way of choosing between a fixed and a random effect model is running a Hausman test. The Hausman test tests the null hypothesis if the coefficients of the random effects model are the same as the ones of fixed effects model. If they are and therefore have an insignificant p-value, then it is safe and better to use random-effect models. The Hausman test conducted for the model in this study however shows a significant value (at the one percent level) and therefore suggests the use of fixed effects. Thus in this context to estimate the coefficients, a panel data analysis with fixed effect models is conducted. Panel 1 and 2 of Table 3 respectively present the results obtained after regressing equations for Returns on Assets (ROA) and Net Interest Margin (NIM) as specified in section 3.

The first sets of explanatory variables of the model are those that serve to capture the effects of financial liberalization on performance measures in the banking industry. These consist of Number of banks (NBANK), real interest rate (RIR) and nominal effective exchange rate indices (EXR). The three variables respectively captured the impact of financial/banking sector reforms on performance of Nigerian banks.

The variable NBANK proxy the effects of financial structure reform component of financial liberalisation. The major thrust of policy here involves granting of licences to more banks, which is generally indicated by the rapid burgeoning of banking firms operating in the banking sector. As indicated in equations 1 and 2 respectively, this financial liberalization policy has statistically significant effects on the two measures of banks' performance. The results indicated negative effects of increased number of banks on banks profitability (ROA) and a positive effect on intermediation efficiency (NIM) in Nigeria banks. A hundred percentage point increase in number of banks reduced profitability of banks by 65% at 5% significant level and increased efficiency by 841% at 5% significant level. These results seem to confirm the realities of the outcomes of financial liberalisation in Nigerian banking industry. While reforms of the financial structure lead to increases in the number of banks, the truth remains that most of these new banks are marginal and rent seeking banks, the industry still remained dominated by large, well established banks, and hence in general increases in the number of banks did not translate to improved profit performance. The positive effect on net interest margin (NIM) is expected apriori. This is implying that increased number of banking firms within the industry engendered more competition that offers consumers wider choices, which naturally enhanced efficiency in the industry.

Table 3: Determinants of Banks Performance in Nigeria

Dependent Variable:	**Panel 1** **Log(ROA)**	**Panel 2** **Log(NIM)**
Constant	1.85	-249.85*
	(-0.04)	*(-3.66)*
Log(NBANK)	-0.65*	8.41*
	(-6.04)	*(5.08)*
Log(RIR)	-0.31**	7.08*
	(2.06)	*(4.22)*
Log(EXR)	-0.25	0.85
	(-0.16)	(1.09)
Log(CAP)	-0.03	0.005
	(-0.4)	*(0.12)*
Log(BLOAN)	0.52**	0.10
	(2.5)	*(0.35)*
Log(INSIZE)	0.13	-0.08
	(0.51)	*(-0.42)*
Log(RSIZE)	3.93***	19.86*
	(1.99)	*(8.22)*
Log(MCAP)	-2.33**	-20.13*
	(-2.73)	*(-7.13)*
Log(SBS)	-0.52	0.66
	(-0.63)	*(1.23)*
Summary Statistics		
Adj. R-Square	*0.76*	*0.95*
Durbin-Watson Statistic	*1.91*	*2.27*
F-Statistic	*2.12*	*49.12*
Prob(F-statistic)	*0.02*	*0.00*

Notes: Panel 1 and 2 respectively presents the results of estimation of equation 2 for the determinants of Profitability and intermediation efficiency in Nigerian banks. *t-statistics are in brackets, * Indicates significant at the 1% level, ** significant at 5% level and *** significant at the 10%level.*

The Real Interest Rate (RIR) variable captured the effects of interest rate deregulation component of financial liberalisation on measures of bank performance. Regression results from equation 1 indicated a statistically significant and negative effect of policy of interest rate deregulation on banks profitability performance. As indicated in equation 1, a hundred percentage point increase in real interest rate contracts profit performance in Nigerian banks by 31.07 % at 5% level of significance. While this result contradict theoretical expectations, it could be explained in the context of the extreme volatility and swings in interest rate movements, which created unstable conditions for banks and other allied financial institutions during the period. As expected, interest rate deregulation exerts positive and statistically significant effects on banks net interest margin, confirming that the policy had improved the efficiency of financial intermediation within the industry. A hundred percentage point increase in real interest rate increased financial inter mediation efficiency of banks by 708.3% at 5% level of significance.

The nominal exchange rate variable (EXR) was used to account for the foreign exchange rate reforms component of the financial liberalisation programme. However results from both the profit and net interest margin equations indicated that the variable failed to explain variations in both measures of banks performance, as the variable turns out insignificant in both equations. Although this is not in line with apriori expectations, it may find explanations in the fact that during the period under analysis, most banks, especially the new generation banks have high preponderance for below the counter dealings in foreign exchange transactions for rent seeking purposes. Most of these dealings failed to be reflected in their official records to circumvent regulatory sanctions. Three bank's characteristics indicators are used as internal determinants of performance. They comprise the ratio of equity capital to total assets (CAP), the ratio of bank's loans to total assets (BLOAN), and the log of bank assets (LNSIZE).

Contrary to expectations, the bank capital variable turned out insignificant in both the profitability and net interest margin models. These outcomes however find plausible explanation within the context of the fact that virtually all banks in operation prior to 2005 banking consolidation exercise were grossly undercapitalized, and thus making their capital base an insignificant factor in their performance profile. As will be expected, bank loans, being the main source of income indicated a positive and statistically significant effect on banks profitability performance. A hundred percentage point increase in deposit-loan transformation contributes to a 52-percentage point increase in banks profits at 5% level of significance. This variable however turned out insignificant in the net interest margin model. The last variable considered under the bank internal characteristics variable is Size (LNSIZE). This variable is intended to capture size related economies and diseconomies of scale in banks performance. This variable also turned out insignificant in both the profitability and bank efficiency model, suggesting that size does not matter in banks performance in Nigeria. The last sets of variables considered in the estimated model are financial structure indicators that serve to examine how the performance of the banking sector is related to the relative development of the banks and stock markets.

The first variable under this category is Relative size (RSIZE) is calculated as the ratio of the stock market capitalization to total assets of deposit money banks, thus this variable served to measure the relative size of the bank deposit market to the stock market. In line with apriori expectations, the variable turned out to be a significant variable in explaining both profitability and efficiency performance in Nigerian banks. At 5% level of significance, a one percentage point increase in relative size of the banking sector contributed a 39.3% increases in banks profit performance and at 1% level of significance contributed 198.6% increases in banks net interest margin efficiency.

The next variable under this category is stock market capitalization (MCAP) which proxy for the effect of overall financial sector development on banks performance. The estimation results indicated that the variable significantly explained variations in profitability and net interest margin in Nigerian banks. However, the direction of causation is negative, which is quite contrary to expectation. The results from equation 1 indicated that a one-percentage point increase in the index of financial development contracts profit performance in Nigerian banks by 233% at 1% level of significance, while it contracts net interest margin by 201% at 1% level of significance, as indicated in equation 2.

The last financial structure variable considered in the model - the ratio of total assets of the deposit banks to GDP (SBS) is intended to measure the importance of bank financing in the economy. It may also indicate the complementarities or substitutability between bank and equity market financing. As indicated in equations 1 and 2, the variable turned out not to significantly explains variations in banks profitability and net interest margin performance.

Information provided by the R^2, DW and F - statistics are used to evaluate the statistical reliability of estimated equations 1 and equation 2. Results indicated that our model equations are adequate representation of the data. The value of R^2 adjusted in the profitability model is 0.7686 and 0.9569 for the profit and the net interest margin model respectively. This indicated that the regressors included in the systems of equations jointly explain about 76% and 95% of variations in profit and net interest margin. To test for the overall explanatory power of our model equations, the F - statistic computed for the equations showed that estimated parameters are jointly significantly different from zero. This is because the calculated F-statistics of 2.12 and 49.12 for the profitability and net interest margin respectively are all greater than their corresponding theoretical F-statistic values. This is an indication that our models are adjudged statistically good for forecasting purposes.The Durbin Watson statistics ranges between 1.91 and 2.27 in all our model equations. These indicate absence of autocorrelation in our analysis.

SUMMARY AND CONCLUSION

This study broadly examined the impact of financial reforms on banks' organizational performance in Nigeria between 1995 and 2004. It specifically determined the effects of policies of interest rates deregulation, exchange rate reforms and bank recapitalization on banks performance, and analyzed how banks internal characteristics and industry structure affect the performance of Nigerian banks. The result of econometric panel regression analysis confirmed that the effects of government policy reforms, bank specific characteristics and industry structure has mixed effects on banks profitability level and net interest margin of Nigerian banks. Bank specific characteristics appear to have significant positive influence on bank's profitability and efficiency level, while industry stricture variables appeared not to have contributed meaningfully to the profitability and efficiency performance of banks in Nigeria.

The major limitation of this study is its limited period of analysis. There is the need to expand the scope by investigating the same issue over a wider time frame in order to examine the possibility of a structural change in the performance of banks from the period when regulated monetary policies were used and when the market determined policies were adopted. Also, the recently introduced recapitalization process was not considered as one of the variables used in the model because of the time period selected for the study. Effort could be made to include this variable in the estimation of bank reforms and performance in Nigerian banking sector.

REFERENCES:

Abdurohman, A. (2003), "The role of financial development in promoting economic growth' Empirical evidence of Indonesian Economy", *Journal of Keuangan dan Moneter. (6) (2).101-110*

Agboola, A.A. (2006): "An Evaluation of the Adoption of Information and Communication Technology (ICT) in the Banking Industry in Nigeria". *Unpublished Ph.D thesis submitted to the Department of Management and Accounting, Obafemi Awolowo University, Ile-Ife.*

Ajilore O.T (2003) "Financial Sector Reforms, Investment Conditions and Private Investment in Nigeria". *An Unpublished M.Sc Thesis Submitted to the Dept. of Economics Obafemi Awolowo University.*

Canmen M. R. and L. Tokatlidis, (2000), "Financial Liberalization; the African Experience". *A paper prepared for African Economic Research Consortium Workshop Dec. 2-7.*

CBN 2004, "Annual Reports and Statement of Accounts" *A Publication of Central Bank of Nigeria Garki Abuja.*

CBN, (2005), "Statistical Bulletin (16) Bank" *A Publication of Central Bank of Nigeria Garki Abuja.*
Central Bank of Nigeria (1993), "Perspectives of Economic Policy Reforms in Nigeria". *A Publication of Central Bank of Nigeria Garki Abuja.*

Chang and Velasco (1998), *The Political Economy of Industrial Policy*. London, Macmillan Publishers.

Demirgtic–Kunt, A. and Detragiache E. (1998) "Financial Liberalization and financial fragility". *A Paper prepared for the 1998 World Bank Annual conference on development economics.*

Heiko Hese (2007), "Financial Intermediation in the Pre consolidated Banking Sector in Nigeria", *World Bank Policy Research Paper 4267. hhesse@worldbank.org.*

Ikhide, S.I. and A.A. Alawode (2001), "Financial Sector Reforms, Macroeconomic Instability and the order of economic liberalization; The Evidence from Nigeria." *African Economic Research Consortium Paper. 112, Nairobi.*

Kharkhate, B.R. (1975), "Financial Intermediation, Savings Mobilization and Entrepreneurial Development: The African Experience*, IMF Staff Papers.*

McKinnon R.I (1973), *Money and Capital in Economic Development* Washington: The Brookings Institutions.

Mishkin, F.S. (2001), "Understanding Financial Crises, A Developing Country Perspective". In Bruno and Pleskovic (eds.), *Annual Bank Conference on Development Economics. The World Bank Washington D.C.*

Nnanna O.J (2003), "Appraisal of financial sector Performance and 2002/2003 Monetary Policy Measures" *The Billion, A Publication of CBN (27) (3).*

Shaw E.M (1973), *Financial Deepening in Economic Development*. New York, Oxford University Press.

Soludo C.C (2004) "The Obasanjo Reforms, Banking Sector" *A Publication of the Federal Ministry of Information and National Orientation. Abuja.*

Sundarajan, V. and Balino (eds) (1991), "Banking Crises, Cases and Issues", Washington, *International Monetary Fund Paper 142.*

BIOGRAPHY

Mr. Olubayo Olajide is currently the Head, Department of Business Administration, Faculty of Management Sciences, Lagos State University, Ojo, Lagos, Nigeria. Email: bayolajide@yahoo.com

Dr. Taiwo Asaolu is an Associate Professor of Accounting at the Obafemi Awolowo University, Nigeria. He can be contacted at :Department of Management and Accounting, Obafemi Awolowo University, Ile-Ife, Nigeria. Email: twasaolu@yahoo.co.uk

Mr. Ayodele Jegede is a lecturer at the Department of Banking and Finance, Faculty of Management Sciences, Lagos State University, Ojo, Lagos, Nigeria. Email: greatjegede1@yahoo.com

WHICH COUNTRIES ARE THE TARGETS FOR ANTI-DUMPING FILINGS?

Sasatra Sudsawasd, National Institute of Development Administration

ABSTRACT

This study examined the relationship between anti-dumping filings and macroeconomic indicators of a targeted country. Focus was placed on trade policy indicators using panel data drawn from 97 countries over the period 1995 to 2005. It was determined that the number of anti-dumping filings decreased with a targeted country's liberal trading regime success. For (targeted) developed countries, greater overall trade-flow expansions and applied tariff reductions for non-agricultural products had a negative impact on the number of anti-dumping charges. On the contrary, trade policies in (targeted) developing countries were found to have no significant impact on the decision to file anti-dumping lawsuits by filing countries.

JEL: F10; F13

KEYWORDS: Anti-dumping, Trade policy

INTRODUCTION

Since 1980, there has been a substantial increase in the use of administrative protections, especially in relation to anti-dumping measures. The rise in anti-dumping usage has spread from the "major four countries," Australia, Canada, the European Union (EU), and the United States (U.S.), to other countries around the world (Prusa, 2005). Anti-dumping measures have clearly emerged as an important trade policy tool among countries.

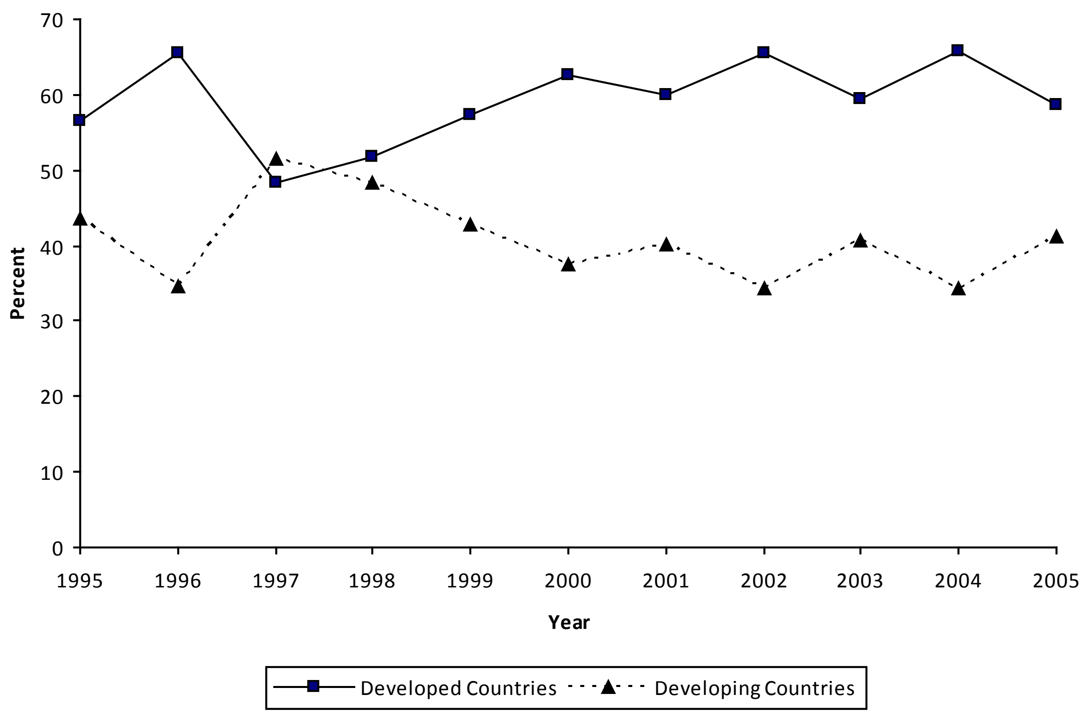
Trade policy has been commonly viewed as the major policy provoked barrier to trade (Ekanayake and Ledgerwood, 2009). For instance, one of the key explanations for the unprecedented rise in anti-dumping use in many countries is the success of the Uruguay Round tariff liberalization (Feinberg and Reynolds, 2007). Miranda *et al*. (1998) suggested that tariff liberalization has been accompanied by the widespread use of other administrative protections, including anti-dumping duties, to maintain some level of protection for the domestic industry against the surge in import competition.

Anderson and Schmitt (2003) theoretically revealed that there is a shift from tariff protection to quotas and anti-dumping restrictions when tariff liberalization occurs. However, Sudsawasd (2012) pointed that tariff reduction may not necessarily be associated with an increase in the use of anti-dumping measures. It is uncertain whether a foreign firm will lower its export price with a lower tariff rate in an import country. If the firm raised its export price since it may possess some market power in the export market, then it is less likely for export countries to confront them with an anti-dumping charge. Conversely, the relationship may be ambiguous and is a matter of empirical evidence. For the empirical studies on this subject, Feinberg and Reynolds (2007) and Moore and Zanardi (2008) found that tariff liberalization was associated with an increase in anti-dumping petitions, at least for developing countries. In addition, Sudsawasd (2012) found that the effects of tariff liberalization on anti-dumping use varied across world regions and developed countries were likely to be more sensitive than developing countries to tariff policy change in most world regions.

Despite the large number of existing studies that have investigated the influence of various determinants on anti-dumping filings (e.g., Knetter and Prusa, 2003; Aggarwal, 2004; Sadni Jallab *et al*., 2006; Sudsawasd, 2012), studies on the relationship between macroeconomic conditions in targeted countries and the number of anti-dumping petitions charged against them have been relatively scarce (e.g., Prusa and Skeath, 2002; Feinberg and Reynolds, 2008). Especially, there has been scarcity of empirical research focusing mainly on the relationship between trade policy in a targeted country and anti-dumping filings. Hence, a departure of this study from the others would be to focus on this relationship across countries, if one exists.

Figure 1 illustrates that developed countries have remained the major target of anti-dumping petitions (almost 60 percent of the total cases). The shares of anti-dumping initiations charged against developed and developing countries have been widening since 1997. In Figure 2, the reductions in applied tariff rates are observed in both developed and developing, but by a much higher percentage in developing countries over the same period. These stylized facts raise the question as to what extent have macroeconomic factors of targeted developed and developing countries triggered the use of anti-dumping measures by filing countries.

Figure 1: Share of Anti-dumping Initiations Charged against Developed and Developing Countries

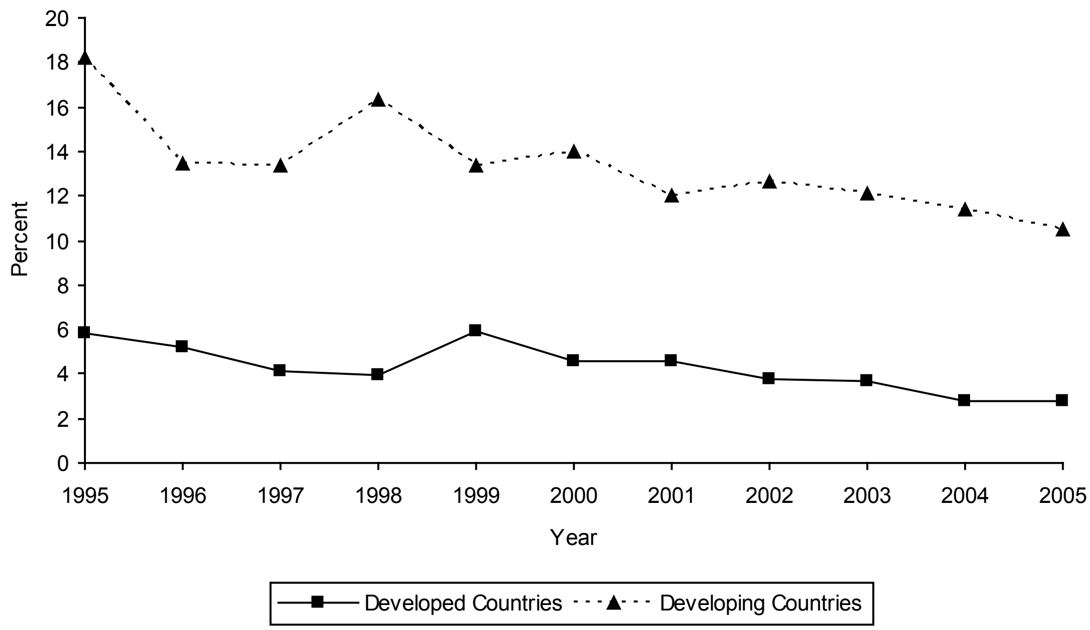


This figure shows the trends in the share of anti-dumping initiations charged against (targeted) developed and developing countries during the period 1995 to 2005. The share of developed countries has remained above the share of developing countries. The data were taken from Chad P. Bown (2007)'s the Global Antidumping Database (version 3.0) and based on the set of countries used in this empirical analysis.

Therefore, this study will empirically examine the influence of macroeconomic factors on the two groups of targeted countries, developed and developing countries, in relation to the number of anti-dumping petitions. As stated, the focus of this study will be on trade policy in a targeted country. In addition, this study will explore the comparative framework of whether macroeconomic determinants of being a target of anti-dumping actions in developed and developing countries are the same. This will be conducted by using unbalanced panel data from 97 countries over the period 1995 to 2005. Macroeconomic factors included in this analysis will include the real exchange rate, economic growth, inflation rate, and number of anti-dumping charges against a targeted country in the previous year. In addition, six alternative trade policy indicators will be introduced. The first three indicators are based on the measure of overall trade policy and include total trade share, export share, and import share in the gross domestic product (GDP).

The other three measures are based on the measure of overall trade distortion in relative prices and include import tariff rates for all products, agricultural products, and non-agricultural products. The aim of the findings is to provide a better understanding of the macroeconomic conditions that lead to an increased likelihood of being a target of anti-dumping use. This information will be useful for policymakers and have implications for future trade negotiations.

Figure 2: Average Applied Tariff Rates for All Products



This figure shows the trends in the average applied tariff rates for all products during the period 1995 to 2005. The average applied tariff rates have declined significantly in both developed and developing countries during this period. The data were taken from the World Bank's World Trade Indicators and based on the set of countries used in this empirical analysis.

The paper is organized in the following way. In the next two sections, the literature review and empirical specification are presented. Then, the data and other empirical issues, including estimation techniques, are discussed in the fourth section. In the fifth section, the econometric results are presented. Finally, concluding remarks are included in the sixth section.

LITERATURE REVIEW

There are two main strands of the economic literature on anti-dumping, as summarized by Moore and Zanardi (2008). For the first strand, the literature focuses on the determinants of anti-dumping initiations by filing countries. For instance, Knetter and Prusa (2003) used data on anti-dumping filings from Australia, Canada, the EU, and the U.S. to analyze the filing patterns within these four major countries. The link between real exchange rates and anti-dumping filings was shown. Sadni Jallab *et al*. (2006) found similar results using a smaller sample of the U.S. and the EU. However, the effect of a change in the real exchange rate on anti-dumping usage was greater in the U.S. In Aggarwar (2004), the dataset was expanded to 99 countries over the period 1980 to 2000. The use of anti-dumping measures was found to spread among developing countries not only due to greater tariff liberalization pressures but also as many countries would like to create anti-dumping ability to counter the anti-dumping use against them.

The second strand of the literature focuses on the role of foreign retaliation. Feinberg and Reynolds (2007) employed the probit analysis of all World Trade Organization (WTO) members between 1995 and 2004 and found a positive and significant retaliation effects. The probability of filing an anti-dumping petition against a country that filed a petition against it in the previous year is 200 percent higher than those countries who did not file. In the subsequent work, Feinberg and Reynolds (2008) focused on the role of macroeconomic determinants of anti-dumping actions by the U.S. and revealed that the growing number of anti-dumping cases filed against the U.S. exporters was in part explained by retaliation for the U.S. trade policy actions. In general, the findings in both Feinberg and Reynolds (2007) and Feinberg and Reynolds (2008) are consistent with those of Prusa and Skeath (2002), in which half of all anti-dumping patterns were found to follow with strategic motives such as retaliation incentives. Not only foreign retaliation playing a major determinant of a country to be filed with anti-dumping actions, Yuefen (2007) provided a broad discussion on other major factors (both external and domestic factors) that can influence the likelihood of China being a target of anti-dumping investigation.

These existing literatures clearly suggest that, not only conditions of a filing country influence anti-dumping usage, but also conditions of a targeted country can be other important determinants of anti-dumping filing behavior. The main contribution of this study into the literature is to provide an empirical examination to identify macroeconomic conditions in targeted countries that have been found to explain anti-dumping usage by filing countries.

EMPIRICAL SPECIFICATION

To examine the macroeconomic determinants of being a target of anti-dumping actions, the number of anti-dumping filings charged against a country, this study's dependent variable, must be clarified. This number is assumed to have a positive relationship with the likelihood of being a target of anti-dumping measures. As stated previously, four variables were identified as the explanatory variables to always be included in the model. These variables are the real effective exchange rate, annual real GDP growth, inflation, and the previous year's number of anti-dumping petitions, as a foreign country under anti-dumping investigation. These variables have previously been identified as the important explanatory variables determining anti-dumping initiations in a filing country (e.g., Aggarwal, 2004).

There are two criterions for a country to be entitled to file anti-dumping lawsuits. First, there is the evidence of "less than fair value (LTFV)," which is when foreign firms export and set the price below the normal price charged in other markets, or below the cost of production plus a normal profit. Second, there is the evidence of "material injury," in which domestic firms must provide information of dumping practices, such as the reduction in import price and increase in import quantity, as well as, the proof of consequent damage suffered to the domestic industry from the dumped import products. The likelihood of being a target of anti-dumping use is presumed to have a positive correlation with the probability of confronting "LTFV" or "material injury" charges.

Based on the two criterions, Knetter and Prusa (2003) showed that the relationship between the real exchange rate and the number of anti-dumping initiations in filing countries was ambiguous. An appreciation in the domestic currency will increase the chance of the material injury. Since foreign firm's costs (in the domestic currency) fall, the firm may lower its export price. This is expected to lower the profits of the domestic firms. However, if foreign firms set the relative export price (in the foreign currency) higher than other export destinations, then there is a less likely chance of being found guilty of less than fair value pricing.

By using a similar principle, the impact of a change in an export country's real effective exchange rate on the probability of being charged with anti-dumping petitions is unclear. An appreciation of an export country's currency is likely associated with an increase in the export price. In this case, the likelihood of facing anti-dumping charges with a material injury determination would decrease. On the contrary, a foreign firm may lower its export price to maintain its status in the export market. Under such a circumstance, less than the fair value determination is more likely. Thus, the overall impact is hypothesized to be ambiguous.

For the impact of an export country's GDP on the number of anti-dumping charges, a country in a recession may cut its export price in order to stabilize its excess domestic supply. In this case, the likelihood of the export country facing anti-dumping charge with a less than fair value determination is generally increased. Hence, the effects of GDP growth are hypothesized to be negative.

Inflation in export countries is expected to have a negative impact on the likelihood of being a target of anti-dumping filings. This is because foreign firms likely bear a higher cost of production with the rise in inflation, leading to an increased export price. Hence, the likelihood of material injury and less than fair value pricing determinations would decrease. Finally, the number of anti-dumping initiations charged to a country in a year may be influenced by the number in the previous year, in which the relationship was hypothesized to be positive. Thus, the base model is the following functional form:

$$AD_{it} = f(\overset{(?)}{REER_{it}}, \overset{(-)}{GDPG_{it}}, \overset{(-)}{INFL_{it}}, \overset{(+)}{AD_{it-1}}) \quad (1)$$

where:

AD_{it} = number of anti-dumping initiations against export country *i* in year *t*,

$REER_{it}$ = real effective exchange rate in export country *i* in year *t*,

$GDPG_i$ = growth rate of real GDP in export country *i* in year *t*,

$INFL_{it}$ = inflation rate in export country *i* in year *t*,

AD_{it-1} = number of anti-dumping charges against export country *i* in year *t*-1.

The base model is augmented by introducing a set of trade policy related indicators, as the variables of interest. The relationship between liberalizing trade policy in an export country and the number of anti-dumping petitions charged was hypothesized to be ambiguous. When an export country opens up to an increase in trade, such as its export penetration, the probability of being charged with the affirmative material injury determination would likely increase. However, retaliation can be one of the factors influencing anti-dumping behavior in a filing country. With a more liberal trading regime (including the decreased use of administrative protections), the likelihood of a country to be retaliated against with an anti-dumping accusation would decrease.

As suggested by Dean *et al*. (1994), two approaches can be used to assess the overall effects of trade policy. One is to measure the overall trade policy from trade flows. The other is to measure the overall trade distortion in relative prices. Thus, six alternative trade policy related indicators are proposed. Based on the measure of trade flows, the first three indicators include: 1) *Total Trade Share* (*TRADE*), 2) *Export Share* (*EXSHARE*), and 3) *Import Share* (*IMSHARE*). These indicators are calculated as the share in GDP. Higher indicator values indicate a higher degree of trade liberalization.

The other three indicators are based on the second approach, the measure of distortion in trade prices. All three indicators are export country applied tariff rates, namely, 4) *Applied Tariff rate for all products* (*TARIFF*-1), including agricultural and non-agricultural products, 5) *Applied Tariff rate for agricultural products* (*TARIFF*-2), and 6) *Applied Tariff rate for non-agricultural products* (*TARIFF*-3). Since an export country applies the tariff rates for all products, agricultural products, and non-agricultural products may have different effects on the probability of being a target of anti-dumping lawsuits. Hence, the impact of each applied tariff rate is evaluated separately. Note that higher values of applied tariff rates denote a lower degree of trade liberalization.

DATA AND EMPIRICAL ISSUES

Anti-dumping initiation data were collected from Bown (2007)'s the *Global Antidumping Database* (version 3.0). This dataset includes detailed information from the WTO data source. As pointed by Moore and Zanardi (2008), WTO anti-dumping data by reporting country may confront important deficiencies of coverage and accuracy. In Bown's dataset, anti-dumping data for each country was based on primary government sources, in which researchers can trace back to the original source. All applied tariff data included simple average tariff rates provided by the World Bank's *World Trade Indicators*. Data on other macroeconomic variables were obtained from the IMF's *International Financial Statistics 2008* and the World Bank's *World Development Indicators 2008 CD-ROMs*.

The set of countries in this study includes all countries with at least one anti-dumping initiation filed against them during the 1980 to 2005 period determined from the *Global Antidumping Database* (version 3.0) dataset. By choosing the set of countries in this manner, this study can avoid the structural zero problem, which could occur with countries that do not have many exports or have no chance of being a target of anti-dumping.

Unbalanced panel data was available for 97 countries during the 1995 to 2005 period. The list of 97 countries is presented in Appendix A. Since developed and developing countries may have difference experiences with being a target of anti-dumping actions, the sample was divided into developed and developing countries following the World Bank classification. In total, there were 36 developed and 61 developing countries. Note that data prior to 1995 were not included in this study due to the unavailability of anti-dumping data during those periods. The number of anti-dumping initiations was non-negative count data. The Poisson model and the negative binomial model are commonly used for the count model. In principle, the Poisson model, assuming the equivalence of the expected mean and variance of a count variable, takes the form:

$$\ln \lambda_{it} = x_{it}\beta \tag{2}$$

and

$$E[y_{it} \mid x_{it}] = Var[y_{it} \mid x_{it}] = \lambda_{it} = \exp(x_{it}\beta) \tag{3}$$

Where: λ is the incidence rate or number of events per time period in which anti-dumping initiation occurs.

The Poisson model has been criticized on the assumption of the equivalence of the variance and expected mean of a count variable. Alternatively, the negative binomial model relaxes the Poisson assumption and allows for an overdispersion structure, in which the variance of the count variable exceeds its mean. The negative binomial model is obtained by generalizing the Poisson model with a conditional mean and variance (see, Greene, 2003, and Cameron and Trivedi, 1998). The overdispersion test, based on the Wald test, was performed. The findings indicated the overdispersion structure. Hence, the negative binomial model was suggested. In addition, the Hausman (1978) specification test was used to test whether the fixed effect or random effect error component model specification was suitable. The Hausman test failed to reject the null hypothesis, in which the estimated coefficients between the two estimators were statistically indifferent at a one percent level of significance. For this reason, the negative binomial model with random effects is used throughout this study.

ECONOMETRIC RESULTS

Estimation results based on the negative binomial model with random effects for all, developed, and developing countries are presented in Tables 1 to 3, respectively, in which the incidence rate ratios (IRR) associated with the estimated coefficients are reported. Note that the IRR is the log of the incidence rate ratio predicted by the model when one unit of an explanatory variable increases, given that the other variables are held constant.

In reference to the pooled data for all targeted countries, the incidence rate ratios derived from the base regression were found to indicate that a change in a targeted country's real effective exchange rate has an insignificant impact on the number of anti-dumping charges. This finding was different from the general finding in some earlier studies on the determinants of anti-dumping use in filing countries. As an example, Knetter and Prusa (2003) found a significant positive relationship between the real exchange rate and number of anti-dumping filings in the "major four countries." More recently, Moore and Zanardi (2008) found that an appreciation of the filing country's exchange rate resulted in an increased probability of observing anti-dumping petitions, but only for developed countries.

As expected, a targeted country's GDP growth and inflation had negative and significant coefficients. These findings suggest that as target economy growth increases by a one percentage point, charges of anti-dumping cases will decrease by 3.3 percentage points (100*(0.9670-1) = -3.3%). Likewise, a one percentage point increase in the export country's inflation rate reduces the expected number of anti-dumping cases being filed by 0.33 percentage points, when the other variables are held constant. The previous year's number of anti-dumping initiations was found to have a significant and positive effect. Note that similar estimated coefficients for the base variables were observed for all model specifications presented in Table 1.

Table 1: Negative Binomial Model with Random Effects for the Sample of All Countries
(Dependent Variable is the Number of Anti-dumping Initiations against a Targeted Country, AD_{it})

Regression	1	2	3	4	5	6	7
$REER_{it}$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	(-0.31)	(-0.07)	(-0.12)	(-0.06)	(-0.14)	(-0.24)	(-0.14)
$GDPG_{it}$	0.9670***	0.9693***	0.9703***	0.9683***	0.9450***	0.9461***	0.9449***
	(-3.45)	(-3.17)	(-3.07)	(-3.27)	(-3.84)	(-3.72)	(-3.85)
$INFL_{it}$	0.9977**	0.9976**	0.9976**	0.9976**	0.9953*	0.9956*	0.9952*
	(-1.88)	(-1.96)	(-1.96)	(-1.96)	(-1.80)	(-1.72)	(-1.8)
AD_{it-1}	1.0192***	1.0175***	1.0169***	1.0181***	1.0182***	1.0192***	1.0184***
	(3.76)	(3.44)	(3.31)	(3.56)	(3.28)	(3.46)	(3.30)
$TRADE_{it}$		0.9957***					
		(-2.73)					
$IMSHARE_{it}$			0.9905***				
			(-2.93)				
$EXSHARE_{it}$				0.9927**			
				(-2.43)			
$TARIFF\text{-}1_{it}$					1.0208		
					(1.57)		
$TARIFF\text{-}2_{it}$						1.0066	
						(1.46)	
$TARIFF\text{-}3_{it}$							1.0176
							(1.35)
No. of obs.	984	977	977	977	624	624	624
No. of group	97	97	97	97	96	96	96
Wald chi2	22.77***	30.79***	32.07***	29.12***	27.74***	26.67***	26.96***

*Table 1 shows the empirical results of the model of being a target of anti-dumping filings for the set of all countries. Estimated coefficients are reported as "incidence rate ratios." Figures in parentheses are t-statistics values. ***, **, and * indicate 1%, 5%, 10% significant levels, respectively.*

For the relationship between trade policy and the probability that a country would be accused of anti-dumping behavior, the estimation results were found to be quite remarkable. First, the estimated coefficients of all trade policy indicators based on the measure of overall trade flows (*TRADE*, *EXSHARE*, and *IMSHARE*) were significant and negative. This finding suggests that trade liberalization policy (including less anti-dumping use) of an export country resulting in higher values of trade flows can reduce the likelihood of being charged with anti-dumping petitions. This reinforces the viewpoint that retaliation may be one of the motives contributing to the higher use of anti-dumping petitions over the last decade.

In analyzing trade policy indicators in relation to tariff policy (*TARIFF*-1, *TARIFF*-2, and *TARIFF*-3), it was interesting to observe that tariff policy was not found to be a key determinant of being anti-dumping use targets. Hence, tariff liberalization in all export countries in the sample had no influence on the decision to file anti-dumping lawsuits.

Regarding to the pooled data for developed countries, the estimated coefficients for inflation and the previous year's number of anti-dumping charges were found to be similar to those from the sample of all countries. With few exceptions, the coefficient on the export country's GDP growth turned insignificant; whereas, the coefficient on the export country real exchange rate was now significant and had a positive sign in the base specification. This finding indicates that developed countries with stronger currencies are more likely to cut export prices to save their export markets. This finding is consistently associated with the higher incidence of the country in facing anti-dumping charges.

Table 2: Negative Binomial Model with Random Effects for the Sample of Developed Countries (Dependent Variable Is the Number of Anti-Dumping Initiations against a Targeted Country, AD_{it})

Regression	8	9	10	11	12	13	14
$REER_{it}$	1.0012*	1.0018**	1.0018**	1.0018**	1.0003	1.0005	1.0006
	(1.68)	(2.45)	(2.45)	(2.40)	(0.46)	(0.56)	(0.87)
$GDPG_{it}$	0.9791	1.0031	1.0052	1.0002	0.9782	0.9798	0.9766
	(-0.92)	(0.14)	(0.24)	(0.01)	(-0.61)	(-0.57)	(-0.7)
$INFL_{it}$	0.9605**	0.9564**	0.9552**	0.9576**	0.9179***	0.9239**	0.9115***
	(-2.16)	(-2.45)	(-2.51)	(-2.39)	(-2.62)	(-2.39)	(-2.84)
AD_{it-1}	1.0310**	1.0192*	1.0190*	1.0199*	1.0544***	1.0563***	1.0521***
	(2.53)	(1.71)	(1.69)	(1.76)	(3.45)	(3.55)	(3.25)
$TRADE_{it}$		0.9936***					
		(-3.28)					
$IMSHARE_{it}$			0.9868***				
			(-3.29)				
$EXSHARE_{it}$				0.9882***			
				(-3.18)			
$TARIFF\text{-}1_{it}$					1.0698		
					(1.63)		
$TARIFF\text{-}2_{it}$						1.0062	
						(0.60)	
$TARIFF\text{-}3_{it}$							1.1005**
							(1.98)
No. of obs.	370	367	367	367	273	273	273
No. of group	36	36	36	36	35	35	35
Wald chi2	33.87***	43.89***	44.37***	42.98***	37.77***	35.51***	41.20***

*Table 2 shows the empirical results of the model of being a target of anti-dumping filings for the set of developed countries. Estimated coefficients are reported as "incidence rate ratios." Figures in parentheses are t-statistics. ***, **, and * indicate 1%, 5%, 10% significant levels, respectively.*

The estimated coefficients for export share, import share, and total trade share were consistent with those from the sample of all countries, in which they were negative and significant. It is interesting to note that only a change in the applied tariff rate for non-agricultural products (*TARIFF*-3) had a significant impact on the likelihood of being anti-dumping use targets at the 5% level of significance. For targeted countries in the developed world, a one percentage point lower in applied tariff rate for non-agricultural products was found to be associated with 10 percentage points reduction in the expected number of anti-dumping lawsuits that the country would be facing. In contrast, the coefficients for applied tariff rates for all products (*TARIFF*-1) and for agricultural products (*TARIFF*-2) remained insignificant.

Table 3: Negative Binomial Model with Random Effects for the Sample of Developing Countries (Dependent Variable Is the Number of Anti-Dumping Initiations against a Targeted Country, Ad_{it})

Regression	15	16	17	18	19	20	21
$REER_{it}$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	(-0.34)	(-0.23)	(-0.20)	(-0.30)	(0.11)	(-0.14)	(0.12)
$GDPG_{it}$	0.9692***	0.9692***	0.9697***	0.9690***	0.9432***	0.9431***	0.9432**
	(-2.88)	(-2.86)	(-2.81)	(-2.88)	(-3.61)	(-3.6)	(-3.62)
$INFL_{it}$	0.9980*	0.9979*	0.9979*	0.9980*	0.9957*	0.9955*	0.9956*
	(-1.69)	(-1.72)	(-1.74)	(-1.69)	(-1.75)	(-1.78)	(-1.76)
AD_{it-1}	1.0117*	1.0117*	1.0112*	1.0118*	1.0102	1.0101	1.0100
	(1.81)	(1.81)	(1.74)	(1.83)	(1.50)	(1.43)	(1.47)
$TRADE_{it}$		0.9981					
		(-0.61)					
$IMSHARE_{it}$			0.9935				
			(-0.99)				
$EXSHARE_{it}$				0.9988			
				(-0.21)			
$TARIFF\text{-}1_{it}$					1.0201		
					(1.28)		
$TARIFF\text{-}2_{it}$						1.0000	
						(-0.00)	
$TARIFF\text{-}3_{it}$							1.0205
							(1.38)
No. of obs.	614	610	610	610	351	351	351
No. of group	61	61	61	61	61	61	61
Wald chi2	10.67**	11.04*	11.71**	10.73*	17.07***	15.09**	17.34***

*Table 3 shows the empirical results of the model of being a target of anti-dumping filings for the set of developing countries. Estimated coefficients are reported as "incidence rate ratios." Figures in parentheses are t-statistics. ***, **, and * indicate 1%, 5%, 10% significant levels, respectively.*

The findings for developing countries suggested that, as an economy in export countries growth, it had a significant and negative impact on the likelihood of being a target of anti-dumping petitions. For all specifications, the coefficient of the export country's real effective exchange rate was insignificant. An increase in the export country's inflation rate reduced the probability of being filed for anti-dumping lawsuits; whereas, the coefficient for the previous year's number of anti-dumping cases in countries that had been victimized had positive impact. However, the impact was barely significant at the 10 percent level and turned to insignificance when the applied tariff rates were added into the base regression. Finally, turning to the coefficients of the six trade policy indicators, all of them were found to be insignificant. Hence, this finding suggests that trade policy changes for export countries do not motivate an anti-dumping use by filing countries.

CONCLUSION

The aim of this study was to empirically examine the relationship between anti-dumping filings and the macroeconomic factors of a targeted country with the focus on trade policy. The analysis was based on the econometric model of anti-dumping filings using unbalanced panel data from 97 countries over the period 1995 to 2005. For the target in developed countries, the number of anti-dumping petitions was found to decrease with an increase in success in a country's liberal trading regime. All trade policy indicators closely related with trade-flow expansion had a significant negative impact on the number of anti-dumping charges; whereas, for tariff policy indicators, only a reduction in applied tariffs for non-agricultural products was found to have a positive impact on anti-dumping filings. On the contrary, for the target in developing countries, all trade policy indicators turned out to have no influence on the decision to file anti-dumping lawsuits by a filing country. Only growth in GDP and the inflation rate appeared to have a robust and significant negative impact on the number of anti-dumping filings.

The evidence presented in this study reinforces the viewpoint that policymakers, at least for those targets in developed countries, should emphasize and place more focus on liberalizing trade policy that leads to real trade-flow expansion. In this case, import sectors and domestic consumers will enjoy cheaper prices of import goods and services, while export sectors will gain from trade expansion that arises from a decreased use of trade protection measures against them. As a result, a country, as a whole, will benefit from trade liberalization and, perhaps, be willing to integrate into the world trading system.

This study serves as one of the first attempts to provide empirical evidence for macroeconomic determinants of being a targeted country of anti-dumping petitions. There remains work to be done. In particular, further studies on more industry-specific analysis will provide better insight on what conditions determine the likelihood of a targeted industry to be filed with anti-dumping charges.

APPENDIX

Appendix A: List of 97 countries included in the analysis

Albania, Algeria, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Belarus, Belgium, Bolivia, Brazil, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Côte d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Ecuador, Egypt, El Salvador, Estonia, Finland, France, Georgia, Germany, Greece, Guatemala, Hong Kong, Hungary, India, Indonesia, Iran, Ireland, Israel, Italy, Japan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Latvia, Libya, Lithuania, Luxembourg, Macao, Macedonia, Malawi, Malaysia, Mexico, Moldova, Mozambique, Nepal, Netherlands, New Zealand, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Saudi Arabia, Serbia , Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Sweden, Switzerland, Tajikistan, Thailand, Trinidad and Tobago, Tunisia, Turkey, Ukraine, United Kingdom, Uruguay, USA, Venezuela, Vietnam, Zimbabwe

REFERENCES

Aggarwal, Aradhna (2004) "Macro Economic Determinants of Antidumping: A Comparative Analysis of Developed and Developing Countries", *World Development*, vol. 32, p. 1043-1057

Anderson, Simon P. and Schmitt, Nicolas (2003) "Non-tariff Barriers and Trade Liberalization," *Economic Inquiry*, vol. 41, p. 80-97

Bown, Chap P. (2007) *Global Antidumping Database Version 3.0*, retrieved 5 January 2009 from the website: http://people.brandeis.edu/~cbown/global_ad/

Cameron, C. and Trivedi, P. (1998) *Regression Analysis of Count Data*, New York: Cambridge University Press

Dean, Juduth M., Desai, Seema, and Riedel, James (1994) "Trade Policy Reform in Developing Countries since 1985: A Review of the Evidence," *World Bank Discussion Paper no.* 267, Washington, DC: World Bank

Ekanayake, E. M. and Ledgerwood, John R. (2009) "An Analysis of the Intra-Regional Trade in the Middle East and North Africa Region" *International Journal of Business and Finance Research*, vol. 3, p. 19-29

Feinberg, Robert M. and Reynolds, Kara M. (2007) "Tariff Liberalization and Increased Administrative Protection: Is There a Quid Pro Quo?" *World Economy*, vol. 30, p. 948-961

Feinberg, Robert M. and Reynolds, Kara M. (2008) "Friendly Fire? The Impact of US Antidumping Enforcement on US Exporters," *Review of World Economics*, vol. 144, p. 366-378

Green, William H. (2003) *Econometric Analysis*, Person Education Press

Hausman, J. A. (1978) "Specification Tests in Econometrics," *Econometrica*, vol. 46, p. 1251-1271

Knetter, M. M. and Prusa, T. J. (2003) "Macroeconomic Factors and Antidumping Filings: Evidence from Four Countries," *Journal of International Economics*, vol. 61, p. 1-17

Miranda, Jorge, Torres, Raul A., and Ruiz, Mario (1998) "The International Use of Antidumping: 1987-1997," *Journal of World Trade*, vol. 32, p. 5-71

Moore, Michael and Zanardi, Maurizio (2008) "Trade Liberalization and Antidumping: Is There a Substitution Effect?" European Center for Advanced Research in Economics and Statistics (ECARES) Working Paper 2008_024

Prusa, Thomas J. (2005) "Anti-dumping: A Growing Problem in International Trade," *World Economy*, vol. 28, p. 683-700

Prusa, Thomas J. and Skeath, Susan (2002), "The Economic and Strategic Motives for Antidumping Filings", *Weltwirtschaftliches Archiv*, vol. 138, p. 389-413

Sadni Jallab, Mustapha, Sandretto, Rene, and Gbakou, Monnet Benoit Patrick (2006) "Antidumping Procedures and Macroeconomic Factors: A Comparison between the United States and the European Union," *Global Economy Journal*, vol. 6, p. 1-20

Sudsawasd, Sasatra (2012) "Tariff Liberalization and the Rise of Anti-dumping Use: Empirical Evidence from across World Regions," forthcoming in the *International Trade Journal*, vol. 26

Yuefen, Li (2007) "Why Has China Become a Target of Anti-dumping Activities?" available from the Website: www.safea.gov.cn/english/content.php?id=12742808

ACKNOWLEDGEMENT

The author would like to thank the editor and the anonymous reviewers of the journal for their comments and Siam Sakaew for his outstanding research assistance.

BIOGRAPHY

Dr. Sasatra Sudsawasd is an Assistant Professor of Economics at National Institute of Development Administration. He can be contacted at: School of Development Economics, National Institute of Development Administration (NIDA), 118 Seri Thai Road, Bangkok 10240, Thailand, Tel: + (66) 2 727-3191; fax: + (66) 2 375-8842. *E-mail*: sasatra@nida.ac.th

THE RELATIONSHIP BETWEEN THE UNITED STATES AND VIETNAM STOCK MARKETS

Luu Tien Thuan, Chung Yuan Christian University, Taiwan

ABSTRACT

This paper uses the Generalized Autoregressive Conditional Heteroscedasticity - Autogressive Moving Average (GARCH-ARMA) and the Exponentially General Autoregressive Conditional Heteroscedasticity-Autogressive Moving Average (EGARCH-ARMA) models to examine the relationship between United States and Vietnam stock markets. The paper analyzes 1,483 daily observations from 2003-2009. The study finds that the U.S. market has a positive and significant influence on the Vietnam market. Specifically, the S&P 500 Index has a positive and strong significant influence to the VN-Index return in recent years. However, there is no evidence of a volatility effect of the S&P 500 Index on the VN-Index. To support the initial findings, the study performs robustness tests to examine the effect of Dow Jones Index on the VN-Index return and shows similar results. Not only do these findings provide additional evidence that Vietnam is a viable market economy but also indicates that fund managers' should consider movement of the U.S. stock market before making Vietnam investment decisions.

JEL: E50, G1

KEYWORDS: Index, stock market, volatility effect.

INTRODUCTION

In recent years, financial markets in both developed and developing countries experienced liberalized capital movement, financial reform, and advances in information technologies. These changes have increased the interaction between domestic markets to other markets in the world. In particular, the linkage between stock markets has increased rapidly. Many studies have found that the U.S. stock market has strong influence on other stock markets. However, until now there is no official research to examine the influence of the U.S. stock market (like S&P 500 and Dow Jones Indices) on the Vietnam stock market (VN-Index). Market analysts frequently try to explain the movement of the Vietnam stock market (VN-Index) in the financial news in relation to movement in the U.S. stock market. Statements such as "*VN-Index declines…after the plunge by Wall Street*" and "*VN-Index is up…due to the soar of Dow*" are quite common. Those claims seem to suggest that the U.S. stock market transmits its influence to the stock market in Vietnam. There is a need to study this effect in order to answer the question: How does the U.S. stock market influence the Vietnam stock market?

This empirical study investigates the effect of a mature stock market on an infant stock market; specifically it examines the influence of the S&P 500 and Dow Jones Indices on VN-Index with special focus on political events between the U.S. and Vietnam governments. The GARCH-ARMA and EGARCH-ARMA models are utilized. The findings showthe U.S. stock market has a positive and significant influence on the Vietnam stock market. The influence of the S&P 500 Index on the VN-Index has become more significant and stronger after visits of top leaders from both countries in 2005. However, there is no volatility effect of the S&P 500 Index on the VN-Index. A robustness test is performed to support the initial findings by examining the effect of Dow Jones Index on the VN-Index return. Using the same method, number of observations and time period, the outcome shows similar results. That is, the U.S. stock market has an influence on the Vietnam stock market that is getting stronger. These findings could provide a basis for fund managers to develop investing strategies. The results provide evidence that Vietnam is a market economy. The Vietnam stock market, like other markets is influenced by the U.S. stock market. The remainder of the article is organized as follows: A literature review is presented in the next section followed by a description of the GARCH-ARMA and EGARCH-ARMA models. A discussion of the data used in the analysis follows. The empirical results are presented and finally, the paper closes with some concluding comments.

LITERATURE REVIEW

There are two broad areas related to interdependence among international markets: interdependence in return (Errunza, 1985) and interdependence in volatility (Hamao et al., 1990; Theodossiou and Lee, 1997; Koutmos and Booth, 1995; Liu and Pan, 1997; Jang and Sul, 2002; Leong and Felminglam, 2003; Darrat and Benkato, 2003; Cifarell and Paladino, 2004; Hoti, 2005). Most studies have focused on developed markets, especially the interdependence among the U.S., Japanese and major European markets. Priyanka, Brajesh and Ajay (2009) find that there is greater regional influence among Asian markets in returns and volatilities than with European and U.S. markets. The Japanese market, which is first to open in daily trading, is affected by the U.S. and European markets only and affects most of the Asian Markets. Hamao et al. (1990) reveal that there are evidences of price volatility spillovers from New York to Tokyo, London to Tokyo, and New York to London. Tatsuyoshi (2003) examines the magnitude of return and volatility spillovers from Japan and the US to seven Asian equity markets and discovers that only the U.S. influences Asian market returns while the volatility of the Asian market is influenced more by the Japan than by the U.S.

Ming and Hsueh (1998) analyze the transmission of stock returns and volatility between the U.S. and Japanese stock markets using futures prices of the S&P 500 and Nikkei 225 stock indices and find that there are unidirectional contemporaneous return and volatility spillovers from the U.S. to Japan. The U.S.'s influence on Japan in returns is approximately four times as large as the influence of Japan to the U.S. and there is a significant lagged volatility spillover from the U.S. to Japan. Angela (2000) examines the magnitude and changing nature of volatility spillovers from Japan and the U.S. to the six Pacific–Basin equity markets by constructing a volatility spillover model which allows the unexpected return of any particular Pacific–Basin market be driven by a local idiosyncratic shock, a regional shock from Japan and a global shock from the US. The study reveals that there are significant spillovers from the region to many of the Pacific–Basin countries.

John et al. (1995) test the conventional wisdom that short-term volatility and price changes spillover from developed markets (New York, Tokyo, and London) to emerging markets (Taiwan and Hong Kong) and investigate how the degree of market openness affects return and volatility spillovers. They find that the Tokyo market has less influence than the New York market over the Taiwanese and Hong Kong markets; and the Taiwanese market is more sensitive than the Hong Kong market to the price and volatility behavior of advanced markets even though Taiwan is not as open as Hong Kong and the Taiwanese dollar is not linked to the U.S. dollar unlike the Hong Kong dollar. John et al. (1997) examine co-movement across international stock markets, particularly studying the spillover effects of volatility among the two developed markets and four emerging markets in the South China Growth Triangular (SCGT) using Chueng and Ng's causality-in-variance test. They discover that the Japanese stock market affects the US stock market and there is a feedback relationship between the Hong Kong and U.S. stock markets. Markets of the SCGT are contemporaneously correlated with the return volatility of the U.S. market; and geographic proximity and economic ties do not necessarily lead to a strong relationship in volatility across markets.

Bekaert and Harvey (1997) examine the volatilities of emerging equity markets and find that in integrated markets global factors influence the volatility, whereas local factors affects the segmented markets. Jang and Sul (2002) analyze the co-movement of Asian stock markets in the past, during and after the Asian Financial Crisis. They conclude that co-movement among the Asian markets increased during the financial crisis period. Hahn (2004) investigates the international transmission mechanism of stock market movements via wavelet analysis by using daily stock indices data from the U.S. and Korean stock markets.

Strong evidence is found for price as well as volatility spillover effects from the developed stock market to the emerging market, but not vice versa.

Many researchers have applied multivariate GARCH models to estimate volatility spillover. In particular, Engle, Ito and Lin (1990) investigate the intraday volatility spillover between U.S. and Japanese foreign exchange markets. Bekaert and Harvey (1997), Ng (2000), Baele (2002), Christiansen (2003), and Worthington and Higgs (2004) used the same model for further application on various capital markets. Karolyi (1995) finds a short-run interdependence of return and volatility between Toronto and New York stock markets. Theodossiou et al. (1997) investigate stock market returns in the U.S., Japan and the UK during 1984 to 1994 and found some statistically significant volatility spillovers from the U.S. and Japan to the UK. Sang and John (1995) examine the repercussions of the relationship between the stock markets of Korea, Japan, and the U.S. and find out that the importance of "volatility spillovers" from Japan and the U.S. on the mean and variance of Korean returns have increased since the announced opening, with most of the effect on the opening prices of the Korean stock market. Hamao et al. (1990) use ARCH model and daily opening and closing prices of major stock indexes for the Tokyo, London, and New York stock markets to explore the short-run interdependence of prices and price volatility across three major international stock markets. Chen and Huang (2008) use the GARCH-ARMA and EGARCH-ARMA models to study the impact of spillover and leverage effects on returns and volatilities of stock index and Exchange Traded Funds for developed and emerging markets.

METHODOLOGY

This study analyzes the influence and level effect of the S&P 500 Index on the U.S. stock market on the VN-Index in the Vietnam stock market by using the GARCH-ARMA and EGARCH-ARMA models. The paper uses the logarithm of daily price index to measure returns. This is the difference between the logarithm of the index at time t and the logarithm of the index at time t-1. The GARCH-ARMA and EGARCH-ARMA models are as below:

The Stock index (S&P 500 Index) returns model:

$$R_{i,t}^{SP} = \alpha_0 + \sum_{i=1}^{g} \alpha_i R_{i,t-i}^{SP} + \varepsilon_{i,t}^{SP} + \sum_{i=1}^{s} \theta_i \varepsilon_{i,t-1}^{SP} \tag{1}$$

where

$R_{i,t}^{SP}$ **:** stock index (S&P 500 Index) returns at period t,

$\varepsilon_{i,t}^{SP}$: stock index (S&P 500 Index) returns residual at period t,

θ_i **:** unknown parameter.

To the stock index (VN-Index) returns model:

$$R_{i,t}^{m} = \beta_0 + \sum_{i=1}^{g} \beta_i R_{i,t-i}^{m} + \varepsilon_{i,t}^{m} + \sum_{i=1}^{s} \gamma_i \varepsilon_{i,t-1}^{m} \tag{2}$$

$$h_{i,t}^{m} = b_0 + \sum_{i=1}^{q} b_i \varepsilon_{i,t-i}^{m^2} + \sum_{i=1}^{p} \zeta_i h_{i,t-i}^{m} \quad \text{, for GARCH} \tag{3}$$

$$Log\left(h_{i,t}^{m^2}\right) = b_0 + \sum_{i=1}^{q}\left(b_i \left| \frac{\varepsilon_{i,t-i}^{m}}{h_{i,t-i}^{m}} \right| + \delta_i \frac{\varepsilon_{i,t-i}^{m}}{h_{i,t-i}^{m}} \right) + \sum_{i=1}^{p} \zeta_i \log\left(h_{i,t-i}^{m^2}\right) \quad \text{, for EGARCH} \tag{4}$$

where

$R^{m}_{i,t}$ **:** stock index (VN-Index) returns at period t,

$\varepsilon^{m}_{i,t}$: stock index (VN-Index) returns residual at period t,

$h^{m}_{i,t}$: conditional variance of stock index (VN-Index) returns at period t,

δ_i : the leverage term,

γ_i **:** unknown parameter.

The effects of returns (S&P 500 Index to VN-Index):

$$R^{m}_{i,t} = \beta_0 + \sum_{i=1}^{g}\beta_i R^{m}_{i,t-i} + dR^{SP}_{i,t-1} + \varepsilon^{m}_{i,t} + \sum_{i=1}^{s}\gamma_i\varepsilon^{m}_{i,t-1} \tag{5}$$

$$h^{m}_{i,t} = b_0 + \sum_{i=1}^{q} b_i \varepsilon^{m^2}_{i,t-i} + \sum_{i=1}^{p}\zeta_i h^{m}_{i,t-i} \text{, for GARCH} \tag{6}$$

$$Log\left(h^{m^2}_{i,t}\right) = b_0 + \sum_{i=1}^{q}\left(b_i\left|\frac{\varepsilon^{m}_{i,t-i}}{h^{m}_{i,t-i}}\right| + \delta_i\frac{\varepsilon^{m}_{i,t-i}}{h^{m}_{i,t-i}}\right) + \sum_{i=1}^{p}\zeta_i \log\left(h^{m^2}_{i,t-i}\right) \text{, for EGARCH} \tag{7}$$

The effects of volatility (S&P 500 Index to VN-Index):

$$R^{m}_{i,t} = \beta_0 + \sum_{i=1}^{g}\beta_i R^{m}_{i,t-i} + \varepsilon^{m}_{i,t} + \sum_{i=1}^{s}\gamma_i\varepsilon^{m}_{i,t-1} \tag{8}$$

$$h^{m}_{i,t} = b_0 + \sum_{i=1}^{q} b_i \varepsilon^{m^2}_{i,t-i} + \sum_{i=1}^{p}\zeta_i h^{m}_{i,t-i} + l\varepsilon^{SP^2}_{i,t-i} \text{, for GARCH} \tag{9}$$

$$Log\left(h^{m^2}_{i,t}\right) = b_0 + \sum_{i=1}^{q}\left(b_i\left|\frac{\varepsilon^{m}_{i,t-i}}{h^{m}_{i,t-i}}\right| + \delta_i\frac{\varepsilon^{m}_{i,t-i}}{h^{m}_{i,t-i}}\right) + \sum_{i=1}^{p}\zeta_i \log\left(h^{m^2}_{i,t-i}\right) + l\varepsilon^{SP^2}_{i,t-i} \text{, for EGARCH} \tag{10}$$

This paper also uses robustness test to examine the effect of Dow Jones Index to VN-Index. The models are the following:

The stock index (Dow Jones Index) returns model:

$$R^{d}_{i,t} = \alpha_0 + \sum_{i=1}^{g}\alpha_i R^{d}_{i,t-i} + \varepsilon^{d}_{i,t} + \sum_{i=1}^{s}\theta_i\varepsilon^{d}_{i,t-1} \tag{11}$$

where

$R^{d}_{i,t}$ **:** stock index (Dow Jones Index) returns at period t,

$\varepsilon^{d}_{i,t}$: stock index (Dow Jones Index) returns residual at period t,

θ_i **:** unknown parameter.

The effects of returns (Dow Jones Index to VN-Index):

$$R^m_{i,t} = \beta_0 + \sum_{i=1}^{g} \beta_i R^m_{i,t-i} + dR^d_{i,t-1} + \varepsilon^m_{i,t} + \sum_{i=1}^{s} \gamma_i \varepsilon^m_{i,t-1} \tag{12}$$

$$h^m_{i,t} = b_0 + \sum_{i=1}^{q} b_i \varepsilon^{m^2}_{i,t-i} + \sum_{i=1}^{p} \zeta_i h^m_{i,t-i} \text{, for GARCH} \tag{13}$$

$$Log\left(h^{m^2}_{i,t}\right) = b_0 + \sum_{i=1}^{q}\left(b_i \left|\frac{\varepsilon^m_{i,t-i}}{h^m_{i,t-i}}\right| + \delta_i \frac{\varepsilon^m_{i,t-i}}{h^m_{i,t-i}}\right) + \sum_{i=1}^{p} \zeta_i \log\left(h^{m^2}_{i,t-i}\right) \text{, for EGARCH} \tag{14}$$

The effects of volatility (Dow Jones Index to VN-Index):

$$R^m_{i,t} = \beta_0 + \sum_{i=1}^{g} \beta_i R^m_{i,t-i} + \varepsilon^m_{i,t} + \sum_{i=1}^{s} \gamma_i \varepsilon^m_{i,t-1} \tag{15}$$

$$h^m_{i,t} = b_0 + \sum_{i=1}^{q} b_i \varepsilon^{m^2}_{i,t-i} + \sum_{i=1}^{p} \zeta_i h^m_{i,t-i} + l\varepsilon^{d^2}_{i,t-i} \text{, for GARCH} \tag{16}$$

$$Log\left(h^{m^2}_{i,t}\right) = b_0 + \sum_{i=1}^{q}\left(b_i \left|\frac{\varepsilon^m_{i,t-i}}{h^m_{i,t-i}}\right| + \delta_i \frac{\varepsilon^m_{i,t-i}}{h^m_{i,t-i}}\right) + \sum_{i=1}^{p} \zeta_i \log\left(h^{m^2}_{i,t-i}\right) + l\varepsilon^{d^2}_{i,t-i} \text{, for EGARCH} \tag{17}$$

DATA DESCRIPTION

There are two main reasons to select the U.S. stock market for this study: (1) the U.S. stock market is one of the leading stock markets in the world; and (2) the foreign direct investment (FDI) from the U.S. into the Vietnam economy has increased sharply in recent years (Table 1). In the first eight months of 2009, the U.S. was the largest foreign investor in Vietnam, occupying \$3,956.1 million of registered capital.

Table 1: The Amount of Investment from the U.S. to Vietnam Market

	Until 27/12/2004	Until 31/12/2007	Until 19/12/2008	Until 31/08/2009
Number of projects	215	376	428	474
Registered capital (Million USD)	1,281.3	2,788.6	4,258.6	8,681.7
Rank	11	8	12	7
Number of countries investing into Vietnam	-	82	84	88

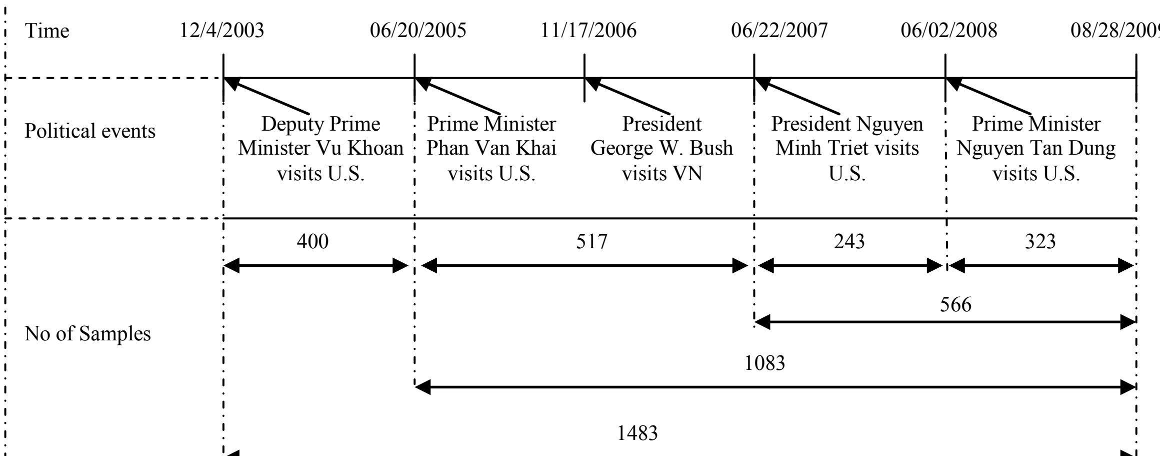
Source: Foreign Investment Agency, Ministry of Planning and Investment (2004, 2007, 2008, 2009)
Notes: This table shows number of projects, the ranking and registered capital from the U.S. to Vietnam market from 2004, 2007, 2008, 2009

The research uses the S&P 500 Index, as it is the most widely used index of large-cap firms in the U.S. stocks market and is the bellwether for the U.S. economy. On the Vietnamese public media, when the U.S. stock market is discussed, the discussion always mentions the S&P 500 Index and the Dow Jones Index. According to Vietnam Foreign Investment Agency, until 21/11/2008, 60% of projects invested in Vietnam from the U.S. focus on the fields of industrial and construction. Therefore, changes in the U.S. economy will greatly affect to the Vietnam economy and the stock market as well.

The data consists of daily prices from three indices over the period of December 04, 2003 to August 28, 2009. The S&P 500 and Dow Jones Indices and the VN-Index data sources extracted from the websites of Yahoo Finance and HoChiMinh Stock Exchange, respectively. Because the U.S. stock market closes at 3

AM (Vietnamese time) and the Vietnam Stock market opens at 8:30 AM, the data uses opening price for VN-Index and closing price for S&P 500 and Dow Jones Indices. The data includes 1483 observations divided into 4 periods based on special political events between the two countries as illustrated in figure 1.

Figure 1: Time, Political Events and Number of Samples



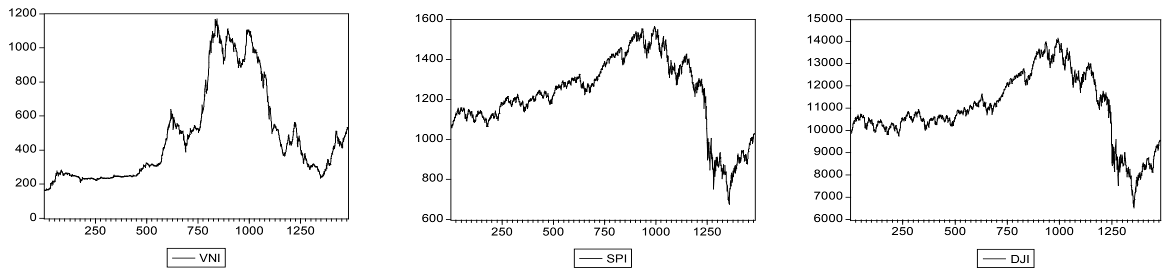
Notes: This figure shows the political events relating to the visits of top leaders from Vietnam and the U.S. from April 2003 to August 2009. The number of samples is divided into 4 sub-groups based on special political events between the two countries.

In each period, the relationship between Vietnam and the U.S. has developed in different ways. On December 04, 2003, Deputy Prime Minister Vu Khoan visited and signed an "Aviation Agreement" with the U.S., and on December 11, 2004, United Airlines of America opened the first direct flight between Vietnam and America. On June 19-26, 2005, Prime Minister Phan Van Khai made an official visit to the U.S. by invitation of President George W. Bush.

This visit strengthened the relationship between the two countries not only on political issues but also on economic and social issues. On November 17, 2006, President George W. Bush visited Vietnam and attended the APEC (Asia - Pacific Economic Corporation) forum in Hanoi. On June 22, 2007, President Nguyen Minh Triet visited Washington and encouraged American investors to invest in the Vietnam market in addition to discussing political relations issues concerning the two countries. As a result, in 2007, investments from the U.S. reached the eighth position. It jumped to the seventh position in the first eight months of 2009 (Table 1) after the visit of Prime Minister Nguyen Tan Dung to the U.S. on June 26, 2008. In short, visits of top leaders from both countries made the relationship tighter and resulted in the influx of investments from the U.S. greatly affecting development of the Vietnam economy and the stock market as well. Figure 2 gives the general pictures of the prices of the three indices from December 04, 2003 to August 28, 2009.

From Table 2, indices are positive and right skewed. The Jarque-Bera statistic for residual normality is not equal to zero indicating that the distribution of the residual is normal distribution. Figure 3 shows the daily returns of VN, S&P 500 and Dow Jones Indices in each period time. The VN-Index is more volatile than S&P 500 and Dow Jones Indices.

Figure 2: Price of VN-Index (VNI), S&P 500 Index (SPI) and Dow Jones Index (DJI) (12/4/03-08/28/09)



Note: These figures show the price of each index in the whole observation period.

Table 2: The Time Span of Datasets and Summary Statistics of the Daily Return of VN, S&P 500 and Dow Jones Indices from December 04, 2003 to August 28, 2009

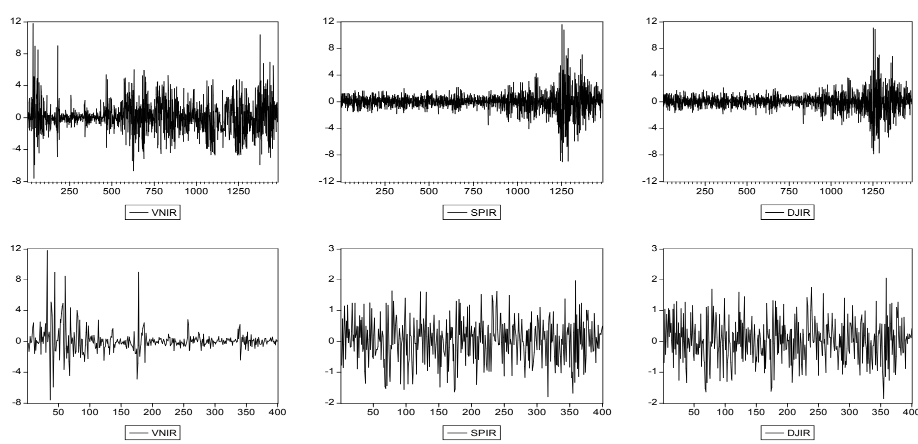
Time	Index	Obs.	Mean	SD	Skewness	Kurtosis	Jarque-Bera
	VNI	1482	0.0985	1.9495	0.4356	5.6442	478.63
12/04/03–08/28/09	S&P 500	1482	0.008	1.4553	0.0482	14.5383	8221.47
	DJI	1482	0.0062	1.3357	0.3175	14.8753	8733.04
	VNI	399	0.1143	1.5829	2.0410	18.4211	4230.62
12/04/03 – 06/17/05	S&P 500	399	0.0347	0.6898	-0.1206	2.8657	1.26
	DJI	399	0.0192	0.6752	0.0414	2.8897	0.32
	VNI	517	0.2959	1.9058	0.0021	3.9050	17.64
06/20/05 - 06/21/07	S&P 500	517	0.0454	0.6474	-0.2868	5.0281	95.70
	DJI	517	0.0490	0.6234	0.3905	4.9221	92.72
	VNI	243	-0.3602	1.7816	0.0830	3.5850	3.74
06/22/07–05/30/08	S&P 500	243	-0.0256	1.3263	0.0561	3.6374	4.24
	DJI	243	-0.0212	1.2150	0.0262	3.4345	1.94
	VNI	323	0.1081	2.4402	0.2790	3.3407	5.7524
06/02/08 – 08/28/09	S&P 500	323	-0.0597	2.6740	0.1163	5.6799	97.38
	DJI	323	-0.0576	2.4295	0.3281	6.0801	133.49
	VNI	566	-0.0930	2.1925	0.3286	3.7178	22.34
06/22/07 – 08/28/09	S&P 500	566	-0.0451	2.1975	0.1119	7.2919	435.61
	DJI	566	-0.0419	1.9991	0.3231	7.7387	539.42
	VNI	1083	0.09266	2.0688	0.1664	3.7654	31.44
06/20/05 – 08/28/09	S&P 500	1083	-0.0019	1.6503	0.0633	12.0057	3660.52
	DJI	1083	0.00145	1.5080	0.3082	12.4946	4085.04

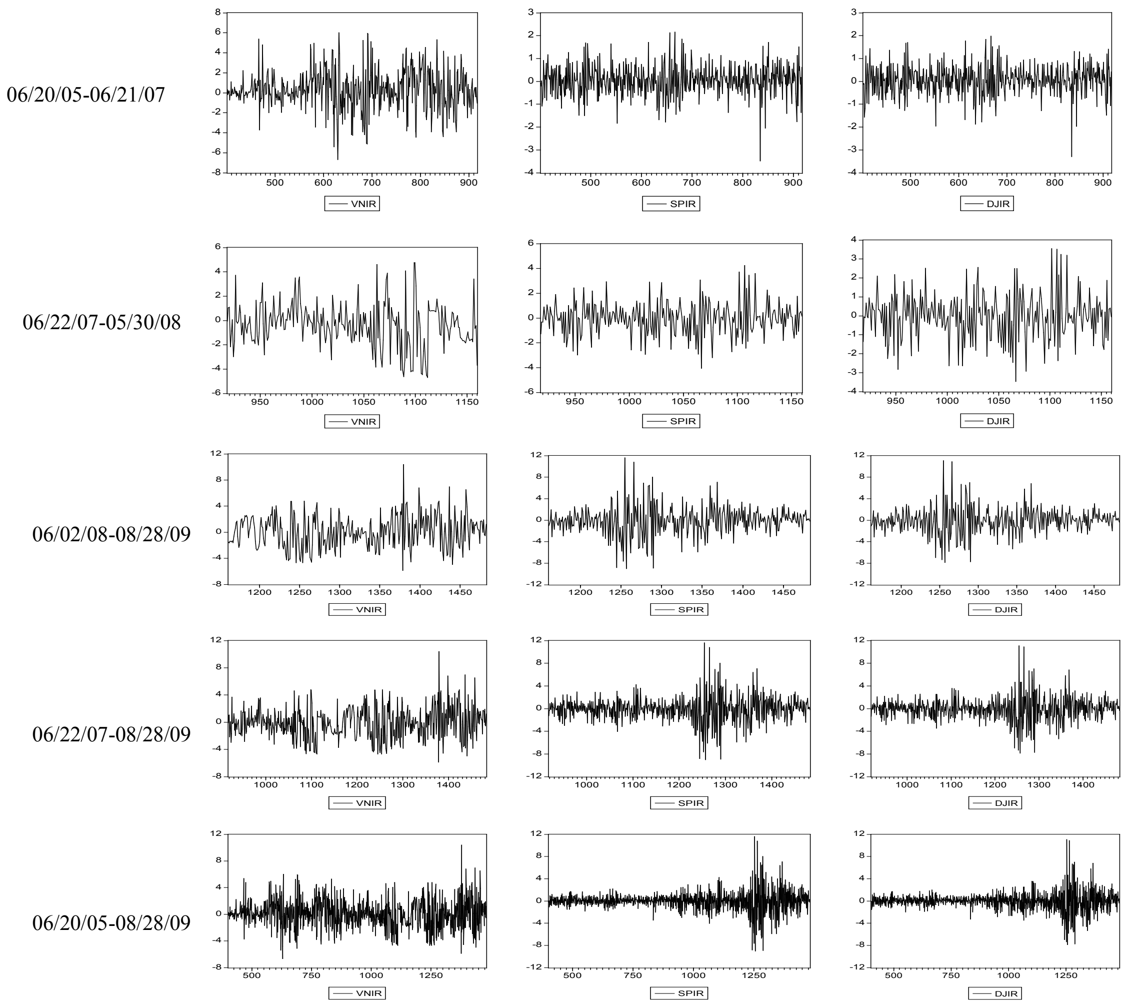
Notes: Obs.: Number of Observations; SD: Standard Deviation; Skewness is a measure of the asymmetry of the probability distribution; Kurtosis is a measure of whether the data are peaked or flat relative to a normal distribution; Jarque–Bera test is a goodness-of-fit measure of departure from normality.

Figure 3: The Daily Returns of VN, S&P 500 and Dow Jones Indices in Each Period Time

12/04/03-08/28/09

12/04/03-06/17/05





Note: These figures show the daily returns of VN, S&P 500 and Dow Jones Indices in each time period.

EMPIRICAL RESULTS

Findings in Table 3 accept the alternative hypothesis of no unit roots (ADF test) in each sample, which support a stationary time series data. The author uses the SBC (Schwarz Criterion) by selecting its minimum value in choosing suitable models of ARMA, GARCH-ARMA and EGARCH-ARMA. The results of LM tests show that there is no serial correlation in each model.

The paper estimates GARCH-ARMA and EGARCH-ARMA models to examine the effects of the S&P 500 and VN indices return. As shown in Tables 4 and 5, the estimation value of $\boldsymbol{\zeta_1}$ is far larger than $\mathbf{b_1}$ means that the lagged conditional variance has a higher explanatory power than the lagged innovation. Moreover, all positive and significant coefficients of b_1 and ζ_1 indicate that the lagged conditional variance of stock returns has a positive impact on current conditional variance.

Table 3: Summary Statistics of Unit-Root, LM and ARCH-LM Tests for VN, S&P 500, Dow Jones Indices

Time period	Type	ADF	ARMA	SBC	LM	ARCH-LM	GARCH	SBC	ARCH-LM	EGARCH	SBC	ARCH-LM
12/04/03	VNI	-17.49 ***	(3,1)	3.74	1.93	11.49 ***	(1,1)	2.73	0.429	(1,1)	2.76	0.075
–	S&P 500	-20.94***	(1,1)	2.11	0.38	0.90						
06/17/05	DJI	-20.97 ***	(2,2)	2.10	0.02	0.26						
06/20/05	VNI	-16.34 ***	(2,2)	4.09	0.11	42.29 ***	(1,3)	3.85	0.029	(1,1)	3.85	0.889
–	S&P 500	-24.04***	(1,1)	1.99	1.12	0.15						
06/21/07	DJI	-23.19 ***	(1,1)	1.92	0.89	0.15						
06/22/07	VNI	-11.99 ***	(0,1)	3.98	1.37	42.07 ***	(1,1)	3.84	0.241	(1,1)	3.86	0.024
–	S&P 500	-19.54***	(0,1)	3.37	0.82	0.01						
05/30/08	DJI	-19.11 ***	(0,1)	3.21	1.04	0.21						
06/02/08	VNI	-14.27 ***	(0,1)	4.58	0.11	28.73 ***	(1,1)	4.49	0.971	(1,1)	4.51	2.960
–	S&P 500	-22.30***	(2,0)	4.78	0.24	9.29***						
08/28/09	DJI	-15.92 ***	(2,0)	4.58	0.58	10.05 ***						
06/22/07	VNI	-18.57 ***	(1,2)	4.37	0.12	63.72 ***	(1,1)	4.20	0.003	(1,1)	4.20	0.854
–	S&P 500	-29.61***	(0,1)	4.37	0.83	21.38***						
08/28/09	DJI	-20.63 ***	(2,0)	4.19	0.99	24.31 ***						
06/20/05	VNI	-25.67 ***	(0,5)	4.23	1.04	119.75 ***	(1,1)	4.01	0.623	(1,1)	4.01	0.649
–	S&P 500	-28.24***	(0,1)	3.80	1.93	64.82***						
08/28/09	DJI	-28.16 ***	(2,3)	3.63	0.02	68.98 ***						

*ADF is the statistics for the Augemented Dickey Fller test with an intercept and trend at the level. SBC is Schwarz Criterion (select minimum value). LM is Breusch-Godfrey Serial Correlation LM test. *** denote significance at α=1% or less.*

Table 4: GARCH-ARMA Result for VN -Index Returns

Time period	Model	Mean equation						Conditional variance equation				
		β_1	β_2	β_3	γ_1	γ_2	γ_5	b_0	b_1	ζ_1	ζ_2	ζ_3
12/04/03 – 06/17/05	GARCH(1,1)-ARMA(3,1)	-0.0797 ***		-0.1310 ***	0.9237 ***			0.0662 ***	0.6621 ***	0.4874 ***		
06/20/05 – 06/21/07	GARCH(1,3)-ARMA(2,2)		-0.4444 ***		0.1935 ***	0.3518 **		0.0557 ***	0.2580 ***	0.8251 ***	-0.6975 ***	0.6292 ***
06/22/07 – 05/30/08	GARCH(1,1)-ARMA(0,1)				0.2379 ***			0.2731 *	0.2717 ***	0.6523 ***		
06/02/08 – 08/28/09	GARCH(1,1)-ARMA(0,1)				0.3028 ***			0.1443	0.1883 ***	0.8011 ***		
06/22/07 – 08/28/09	GARCH(1,1)-ARMA(1,2)	0.9760 ***			-0.7171 ***	-0.2297 ***		0.1799 **	0.2428 ***	0.7341 ***		
06/20/05 – 08/28/09	GARCH(1,1)-ARMA(0,5)				0.2455 ***		0.0706 **	0.0811 ***	0.1779 ***	0.8154 ***		

*Notes: This table shows the result of GARCH-ARMA model to VN-Index returns through specific time period; *, ** and *** indicate significance at 10, 5 and 1% levels, respectively.*

Table 5: EGARCH-ARMA Result for VN - Index Returns

Time period	Model	Mean equation						Conditional variance equation			
		β_1	β_2	β_3	γ_1	γ_2	γ_5	b_0	b_1	ζ_1	δ
12/04/03 – 06/17/05	EGARCH(1,1) -ARMA(3,1)	-0.7692 ***		-0.1483 ***	0.9091 ***			-0.4343 ***	0.6065 ***	0.9332 ***	0.0217
06/20/05 - 06/21/07	EGARCH(1,1) -ARMA(2,2)		-0.4660 ***		0.1986 ***	0.3871 ***		-0.1704 ***	0.2847 ***	0.9532 ***	0.0221
06/22/07 – 05/30/08	EGARCH(1,1) -ARMA(0,1)				0.2400 ***			-0.2147 **	0.3851 ***	0.8878 ***	-0.0818
06/02/08 – 08/28/09	EGARCH(1,1) -ARMA(0,1)				0.3275 ***			-0.1920 **	0.3835 ***	0.9266 ***	-0.0773 *
06/22/07 – 08/28/09	EGARCH(1,1) -ARMA(1,2)	0.9230 ***			-0.6367 ***	-0.2046 ***		-0.2302 ***	0.3860 ***	0.9349 ***	-0.0706 **
06/20/05 – 08/28/09	EGARCH(1,1) -ARMA(0,5)				0.2507 ***		0.0654 **	-0.1865 ***	0.3276 ***	0.9427 ***	-0.0222

*Notes: This table shows the result of EGARCH-ARMA model to VN-Index returns through specific time period; *, ** and *** indicate significance at 10, 5 and 1% levels, respectively.*

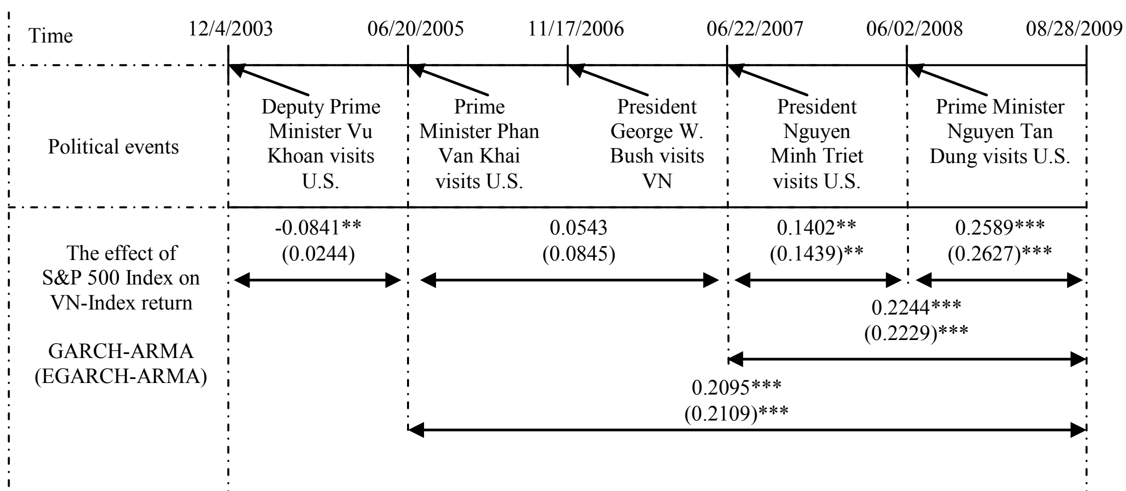
Table 6: The Effect of S&P 500 Index to VN-Index Return through Each Period

Time period	The effect of Returns		The effect of Volatility	
	GARCH-ARMA	EGARCH-ARMA	GARCH-ARMA	EGARCH-ARMA
12/04/03 – 06/17/05	-0.0841**	0.0244	-0.2072	0.0056
06/20/05 – 06/21/07	0.0543	0.0845	0.1020	-0.0022
06/22/07 – 05/30/08	0.1402**	0.1439**	0.0863	-0.0044
06/02/08 – 08/28/09	0.2589***	0.2627***	0.0076	0.0007
06/22/07 – 08/28/09	0.2244***	0.2229***	0.0215	0.0021
06/20/05 –08/28/09	0.2095***	0.2109***	0.0117	0.0014

*Notes: This table shows the effect (returns and volatility) of S&P 500 Index to VN-Index returns through each period by using GARCH-ARMA and EGARCH-ARMA model; *, ** and *** indicate significance at 10, 5 and 1% levels, respectively.*

The multiple GARCH-ARMA and EGARCH-ARMA models are also used to determine whether S&P 500 Index has an effect on VN-Index in terms of returns and variance as illustrated in Table 6. The results show that the lagged S&P 500 Index return has positive and strong effect (0.21) on the VN-Index return after the visits of Prime Minister Phan Van Khai to the U.S. on June 20, 2005 and August 28, 2009. The influence of S&P 500 Index on VN-Index return has jumped from 0.14 in the period June 2007 to June 2008 (after the visiting of President Nguyen Minh Triet to the U.S.) to 0.26 in the period June 2008 to August 2009 (after the visiting of Prime Minister Nguyen Tan Dung to the U.S.). From June 2007 to August 2009, the effect of the S&P 500 Index on VN-Index return is 0.22. In short, the effect of S&P 500 Index on VN-Index return is positive and getting stronger in recent years. It means that through the special political events and visiting of top leaders from the U.S. and Vietnam, the U.S. stock market has influenced the Vietnam stock market. However, there is no volatility effect of S&P 500 Index on VN-Index. Figure 4 illustrates the results.

Figure 4: Time Period, Political Events and Effect of S&P 500 Index on VN-Index Return



, ** and * indicate significance at 10, 5 and 1% levels, respectively. The values in parenthesis are the effects of S&P 500 Index on VN-Index return using EGARCH-ARMA model; the remainder values are the effects of S&P 500 Index on VN-Index Return using GARCH-ARMA model.*

ROBUSTNESS TEST: AN ANALYSIS OF THE EFFECT OF DOW JONES INDEX ON VN-INDEX RETURN

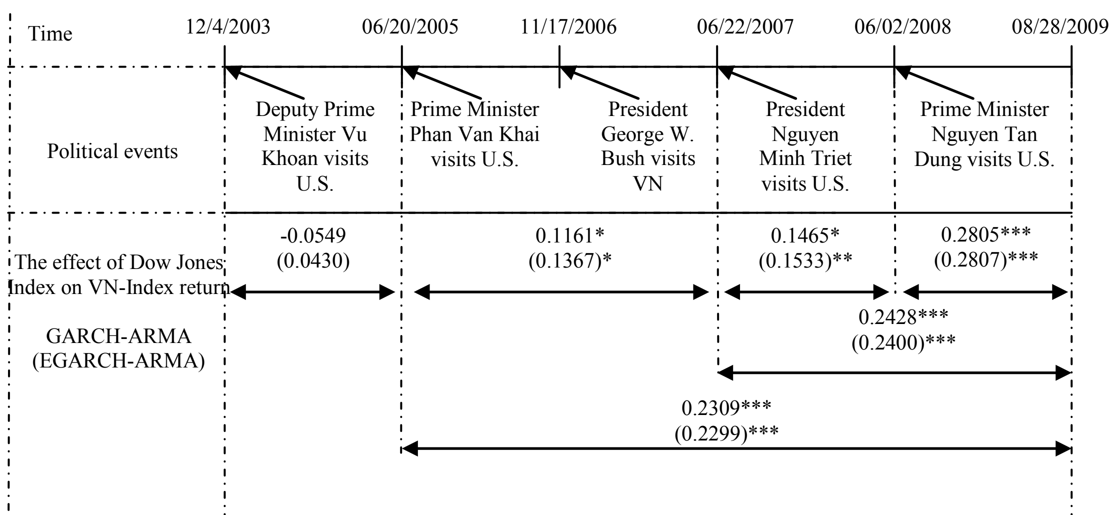
Table 7: The Effect of Dow Jones Index to VN-Index Return from Each Period

	The effect of Returns		The effect of Volatility	
	GARCH-ARMA	EGARCH-ARMA	GARCH-ARMA	EGARCH-ARMA
12/04/03 – 06/17/05	-0.0549	0.0430	0.0659*	0.0166
06/20/05 – 06/21/07	0.1161*	0.1367*	0.0837	0.0516
06/22/07 – 05/30/08	0.1465*	0.1533**	0.1160	-0.0011
06/02/08 – 08/28/09	0.2805***	0.2807***	0.0137	0.0013
06/22/07 – 08/28/09	0.2428***	0.2400***	0.0374	0.0029
06/20/05 –08/28/09	0.2309***	0.2299***	0.0186	0.0020

*This table shows the effect (returns and volatility) of Dow Jones Index to VN-Index returns through each period by using GARCH-ARMA and EGARCH-ARMA model; *, ** and *** indicate significance at 10, 5 and 1% levels, respectively.*

The paper performs robustness tests to examine and analyze the influence and level effect of the Dow Jones Index on VN-Index by using the GARCH-ARMA and EGARCH-ARMA and the same related procedures. The results show that the lagged Dow Jones Index return has positive and strong effect to the VN-Index return in recent years; however, there is no volatility of Dow Jones Index on the VN-Index returns (see Table 7 and Figure 5). By comparing the effect of S&P 500 and Dow Jones Index to the VN-Index returns in each period time, the Dow Jones Index has a stronger effect than S&P 500 Index (see Figures 4 and 5).

Figure 5: Time, Political Events and Effect of Dow Jones Index on VN-Index Return



, ** and * indicate significance at 10, 5 and 1% levels, respectively. The values in parenthesis are the effects of Dow Jones Index on VN-Index Return using EGARCH-ARMA model; the remainder values are the effects of Dow Jones Index on VN-Index Return using GARCH-ARMA model.*

CONCLUSION

This research examines the relationship between the U.S. and Vietnam stock markets. The paper utilizes the multiple GARCH-ARMA and EGARCH-ARMA models in analyzing 1,438 daily observations from 2003-2009 to examine the effects of returns and volatilities of the S&P 500 Index on the VN-Index return. The result shows that there are strong and positive effects of returns of the S&P 500 Index on the VN-Index returns. The paper indicates that the U.S. stock market has an increasing influence on the Vietnam stock market in recent years after the visits of top leaders from both countries. However, there is no volatility effect of the S&P 500 Index on VN-Index. The results of robustness tests using the Dow Jones Index to affect the VN-Index yield similar results. This research is limited as it only considers the S&P 500 and Dow Jones indices that represent to the U.S. stock market. It does not consider other factors that can influence the Vietnam stock market such as oil prices, exchange rates between the U.S. dollar and Vietnam Dong. Future research can examine these issues to further specify the influence of the U.S. to the Vietnam stock market.

REFERENCES

Angela Ng (2000) "Volatility Spillover Effects from Japan and the U.S. to the Pacific–Basin," *Journal of International Money and Finance*, vol. 19(2), p. 207-233

Baele, L. (2002) "Volatility Spillover Effects in European Equity Markets: Evidence from a Regime-Switching Model," *Ghent University*

Bekaert, G., & Harvey, C. (1997) "Emerging Equity Market Volatility," *Journal of Financial Economics,* vol. 43, p. 29-77

Chen, J.-H. and Huang, C.-Y. (2008) "An Analysis of the Spillover Effects of Exchange-Traded Funds," *Applied Economics*

Christianse, C. (2003) "Volatility-Spillover Effects in European Bond Markets," *Working paper, Aarhus School of Business*.

Cifarelli, G., & Paladino, G. (2004) "The Impact of the Argentine Default on Volatility Co-movements in Emerging Bond Markets," *Emerging Markets Review,* vol. 5, p. 427–446

Darrat, A. F., & Benkato, O.M. (2003) "Interdependence and Volatility Spillovers under Market Liberalization: The Case of Istanbul Stock Exchange," *Journal of Business Finance and Accounting,* vol. 30(7), p. 1089–1114

Engle, R.F., Ito, T. & Lin, W.L., (1990) "Meteor Showers or Heat Waves? Heteroscedastic Intraday Volatility in the Foreign Exchange Market," *Econometrica*, vol. 58, p. 525–542

Errunza, V. (1985) "Gains from Portfolio Diversification into Less Developed Countries' Securities," *Journal of International Business Studies,* vol. 8(2), p. 83-99

Hamao, Y., Masulis, R., & Ng, V. (1990) "Correlations in Price Changes and Volatility across International Stock Exchanges," *The Review of Financial Studies,* vol. 3(2), p. 281-307

Hahn S. L. (2004) "International Transmission of Stock Market Movements: A Wavelet Analysis," *Journal Applied Economics Letters,* vol. 11(3), p. 197-201

Hoti, S. (2005) "Modeling Country Spillover Effects in Country Risk Ratings," *Emerging Markets Review,* vol. 6, p. 324–345.

Jang, H., & Sul, W. (2002) "The Asian Financial Crisis and the Co-movement of Asian Stock Markets," *Journal of Asian Economics,* vol. 13, p. 94–104

John W. K. C., Yu J. L, Chau C. Y., Guey S. C. (1995) "Volatility and Price Change Spillover Effects across the Developed and Emerging Markets," *Pacific-Basin Finance Journal,* vol. 3(1), p. 113-136

John W. S. H, Mei Y. C., Robert C. W. F, Bwo N. H. (1997) "Causality in Volatility and Volatility Spillover Effects between U.S., Japan and Four Equity Markets in the South China Growth Triangular," *Journal of International Financial Markets, Institutions and Money*, vol. 7(4), p. 351-367

Karolyi, G. (1995) "A Multivariate GARCH Model of International Transmission of Stock Returns and Volatility: The Case of the United States and Canada," *Journal of Business and Economic Statistics*, vol. 13, p. 11-25.

Koutmos, G., & Booth, G. G. (1995) "Asymmetric Volatility Transmission in International Stock Markets," *Journal of International Money and Finance,* vol. 14 (12), p. 747–62

Leong, S. C., & Felmingham, B. (2003) "The Interdependence of Share Markets in the Developed Economies of East Asia," *Pacific-Basin Finance Journal,* vol. 11, p. 219–237

Liu, Y.A., & Pan, M. (1997) "Mean and Volatility Spillover Effects in the U.S. and Pacific-Basin Stock Markets," *Multinational Finance Journal,* vol. 1(1), p. 47–62

Ming S. P. & Hsueh L. (1998) "Transmission of Stock Returns and Volatility between the U.S. and Japan: Evidence from the Stock Index Futures Markets," *Journal Asia-Pacific Financial Markets*, vol. 5(3), p. 211-225

Priyanka Singh, Brajesh Kumar, Ajay Pandey. (2009) "Price and Volatility Spillovers across North American, European and Asian Stock Markets: With Special Focus on Indian Stock Market," *Social Science Research Network (SSRN)*

Sang W. K, John H. R. (1995) "International Stock Price Spillovers and Market Liberalization: Evidence from Korea, Japan, and the United States," *Journal of Empirical Finance*, vol. 2(2), p. 117-133

Tatsuyoshi M. (2003) "Spillovers of Stock Return Volatility to Asian Equity Markets from Japan and the U.S.," *Journal of International Financial Markets, Institutions and Money*, vol. 13(4), p. 383-399

Theodossiou, P., & Lee, U. (1997) "Mean and Volatility Spillovers across Major National Stock Markets: Further Empirical Evidence," *Journal of Financial Research, vol. 16*, p. 337–50

Worthington, A. & H. Higgs (2004) "Transmission of Equity Returns and Volatility in Asian Developed and Emerging Markets: A Multivariate GARCH Analysis," *International Journal of Finance and Economics,* vol. 9(1), p. 71-80

BIOGRAPHY

Luu Tien Thuan is a Ph.D. student at College of Business, Chung Yuan Christian University, Taiwan. He can be contacted at College of Business, Chung Yuan Christian University, 200 Chung Pei Rd., Chung Li City, Tao Yuan 320, Taiwan (R.O.C). Email: g9704607@cycu.edu.tw or ltthuan@ctu.edu.vn.

The International Journal of Business and Finance Research ♦ Volume 5 ♦ Number 1 ♦ 2011

TERMS OF LENDING FOR SMALL BUSINESS LINES OF CREDIT: THE ROLE OF LOAN GUARANTEES

Raymond Posey, Mount Union College
Alan K. Reichert, Cleveland State University

ABSTRACT

This study examines the role of loan guarantees in lines of credit granted to small businesses. Since there is evidence of simultaneity among lending terms, two-stage instrumental variable procedures are used to obtain consistent parameter estimates. The findings suggest the presence of a loan guarantee is associated with lower interest rates and smaller lines of credit and that loan guarantees and collateral are to some extent substitutes in that loans guarantees are a close substitute for collateral but collateral does not always serve as a close substitute for loan guarantees. Furthermore, firms with longer banking relationships and/or fewer banking relationships are less likely to have loan guarantees.

JEL: G2

KEYWORDS: Term of lending, bank relationships, line of credit

INTRODUCTION

Numerous authors have investigated the importance of banking relationships in lending to small businesses. For example, Petersen and Rajan (1994) find that small firm borrowing is concentrated among a small number of lenders, indicating substantial benefits to developing and maintaining a strong banking relationship. They conclude that the value of the banking relationship relates more to the availability of credit than to a lower cost of funds. Brick, and Palia (2007) study the interrelationship between interest rate, fees, and collateral in small business loans. They note that all three of these factors, in principle, can be negotiated simultaneously to achieve the required return and suitable level of risk. Their empirical findings provide evidence of jointness or endogeneity among the terms of lending.

Not included in the Brick and Palia study is the role of loan guarantees for small business line of credits (LOC). Both loan guarantees and collateral serve to reduce the loss given default (LGD) of a loan and the pledging of personal loan guarantees may also lower the probability of default. On the other hand, loan guarantees and collateral may introduce a moral hazard if the bank relaxes its lending standards assuming that it is not exposed to either the risk of default or a significant loss at default. Furthermore, loan guarantees and collateral can serve as a form of non-price credit rationing as discussed by Stiglitz and Weiss (1981). Thus, on can argue that loan guarantees and collateral are substitutes in the lending process. On the other hand, both have unique dimensions. For example, of the firm pledges corporate assets such as account receivables or inventories the lender must perfect a lien on the assets, monitor them, and liquidate them in the case of default. This is process can involve significant costs and the marketability of the collateral is always an issues. In the cases of loan guarantees the borrower is often asked to pledge his/her personal assets, such as real estate, stock and bonds, and other personal assets. Thus, in the case of collateral the firm's assets are being pledged while in the case of a personal guarantee borrowers are risking their own assets and possible bankruptcy. In addition, there are third party guarantees of course and in the United States, the U.S. Small Business Administration (SBA) was created to assist small businesses and represents one source of loan guarantees for small businesses.

The focus of this research is on the effect loan guarantees have on the interest rates charged and the size of small business LOCs. Two questions will be addressed. First, what are the factors associated with the use of loan guarantees? Secondly, to what extent does the presence of a loan guarantee affect the interest rate charged and the size of the LOC? Along with these variables, this study will also examine the effects of collateral and compensating balances on the specific terms of LOCs. Two additional variables are included in this study which has not been used in prior research. The strength of the banking relationship is often measured by the length of the relationship. This study includes this measure also includes the number of bank relationships that each firm maintains. Firms which maintain a greater number of bank relationships may have weaker individual banking relationships as they spread their loyalty and business around. On the other hand, they may be able to exploit a competitive credit market and negotiate better lending terms. Because of the expected interplay among loan guarantees, collateral, interest rate, and loan size during loan negotiations, the ratio of the dollar value of credit granted scaled by the requested amount is considered. This variable suggests that the amount of credit extended may be an integral part of the bargaining process and whether the borrower or lender has a comparative advantage in the negotiating process. The reminder of this paper is organized as follows. Section 2 reviews the prior literature, Section 3 discusses the data and methodology, Section 4 presents the empirical findings, while Section 5 presents the conclusion.

LITERATURE REVIEW

Stiglitz and Weiss (1981) discuss the conditions under which credit rationing may occur in markets under equilibrium conditions. The authors suggest that interest rates alone may not be sufficient to screen applicants and distinguish good and bad borrowers. They postulate that expected bank returns might reach a maximum at some interest rate and decline at higher rates because of expected higher rates of default. A similar argument is made for collateral requirements. They conclude that credit rationing may be likely, especially under conditions of imperfect and limited information, a typical aspect of lending to small businesses. Using interest rates alone to screen applicants may also introduce an adverse selection problem in that only the riskiest borrowers may agree to such high interest rates. Because of the importance of small businesses to economic growth and recognizing the possible credit rationing behavior, many nations have introduced loan guarantee programs for small business to counter the expected credit rationing behavior of banks.

A number of authors examine the effects of loan guarantee programs. Camino and Cardone (1999) suggest that policy-makers view loan guarantees as substitutes for collateral. The guarantees are granted to induce lenders to extend credit when collateral is not available. Their study summarizes a number of European loan guarantee programs and provides a framework for further study, but does not reach specific conclusions about the costs or effectiveness of such loan guarantee programs. Riding and Haines (2001) survey previous attempts to evaluate the effectiveness of loan guarantee programs and note widely differing rates of default among national programs. They go on to examine the Canadian experience with its loan guarantee program and find it to be quite cost effective. They find higher default rates among newer firms and varying rates of default by industry. They also find that lenders are quite sensitive to the size or portion of the loan that is guaranteed, as small changes in the level of the guarantee are expected to impact default rate and recovery rates. Cowling and Mitchell (2003) study the loan guarantee program in the UK. They find that default rates are positively related to interest rates, consistent with the Stiglitz and Weiss (1981) expectation. They also find that default rates are affected by other variables, including the size of the loan, its purpose, the legal form of the borrower, age of the firm, maturity of the loan, and location of the business.

Glennon and Nigro (2005) examine SBA 7(a) loan guarantees in the US. They first compare the default rate of small business loans to other traded debt securities and conclude that the default rate falls between Ba/BB and B rated corporate bonds, as rated by Moody's and S&P. These are below investment grade, but are of similar default risk as a large number of corporate loans held by banks. They find that newer firms have a higher rate of default than older firms and larger firms have a higher default rate than smaller firms. Higher guarantee percentages were associated with higher default rates. They also found that lenders did not price loans based on risk during the sample period (1983 – 1998).

Doh and Ryu (2004) study loan guarantees among Korean chaebol or borrowing groups. Within the chaebol, there is extensive sharing of information, while between the borrower and lender asymmetric information problems exist. They suggest that the issuance of a loan guarantee by one member on behalf of another in the chaebol is a positive signal regarding the borrower to an outside lender. They further summarize research by Lee and Lee (1998) which indicates that corporate loan guarantees lead to higher debt to equity ratios and suggest that firms within chaebols “over-borrow” because of the availability of these affiliate guarantees. In addition, they suggest that the fees guarantors charge for the guarantees can be viewed as a form of transfer pricing which may lead to distorted incentives. Chakraborty and Hu (2006) study collateral for lines of credit and non-lines of credit. They find that the length of the banking relationship is negatively related to the amount of collateral required, suggesting importance of the durability of the lending relationship.

Brick and Palia (2007) examine the interdependence of interest rates, collateral, and fees using the 1993 Survey of Small Business Finances conducted by the Federal Reserve System for small business lending in the U.S. They found evidence that these variables are jointly or endogenously determined and employ a two-stage least squares (2SLS) procedure to analyze the data. They found a positive correlation among all three variables. Surprisingly, the duration of the banking relationship was not found to be significant, as would be expected for relationship-based lending for small, informationally opaque borrowers. A major contribution of this work is the finding that there appears to be jointness in the way these loan parameters are set, hence, traditional models that ignore these endogenous relationships may produce inaccurate or misleading results. A factor not considered in the Brick and Palia (2007) study nor the Chakraborty and Hu (2006) study was the effect of loan guarantees, which is the focus of this study.

DATA AND METHODOGY

Hypotheses

As mentioned above, loan guarantees can be viewed as reducing the loss given default for the lender, so to the extent that the interest rate reflects anticipated losses, then loans with credit guarantees should have lower interest rates. Since some authors suggest collateral provides a similar function, then collateral also should reduce the interest rate. It can be argued that loan guarantees from other corporate entities or government agencies may add administrative costs and possibly raise the interest rate. However, the premise here is that loan guarantees will reduce the interest rate on lines of credit, all other factors being equal. Secondly, it is expected that the presence of a loan guarantee or collateral would encourage the lender to extend more credit since the bank would expected a larger recovery in the event of default. Unfortunately, one factor not included in the data is whether the loan guarantee covers 100% or some smaller percentage of the total LOC. However, assuming that the loan guarantee provides some protection in the event of default and as suggested by the “over-borrowing” behavior within Korean chaebols lenders should be willing to extend larger amounts of credit.

Therefore, the following two hypotheses are formally tested:

H1: The interest rate charged on lines of credit will be lower in the presence of a loan guarantee and/or collateral.

H2: The size of a line of credit is larger in the presence of a loan guarantee and/or collateral.

Model

There are four endogenous (hypothesis) variables included in this study: the presence of a loan guarantee, loan rate, the size of the LOC, and collateral requirements. These four variables are used to test a number of specific hypotheses relating to the lending process. Control variables are included to capture exogenous effects that have been previously reported in literature, such as, the effect as length of the borrowing relation and specific borrower characteristics including; leverage, cash, fixed assets, ownership structure, number of LOCs outstanding, number of lenders utilized by the borrower, whether the owner is an active manager, and the industry classification based on two-digit SIC codes. Four basic equations will be used to explore this topic. Their general form is shown below.

$$LOCG = \alpha_{11} + \beta_{11}RATE + \beta_{12}LSIZEP + \beta_{13}COLLAT + \beta_{1n}CV + \varepsilon_1 \quad (1)$$

$$RATE = \alpha_{21} + \beta_{21}LOCG + \beta_{22}LSIZEP + \beta_{23}COLLAT + \beta_{2n}CV + \varepsilon_2 \quad (2)$$

$$LSIZEP = \alpha_{31} + \beta_{31}RATE + \beta_{32}LOCG + \beta_{33}COLLAT + \beta_{3n}CV + \varepsilon_3 \quad (3)$$

$$COLLAT = \alpha_{31} + \beta_{31}RATE + \beta_{32}LOCG + \beta_{33}LSIZEP + \beta_{3n}CV + \varepsilon_3 \quad (4)$$

where:

LOCG is binary and indicates the presence of a loan guarantee
RATE is the initial interest rate on the LOC
LSIZEP is the size of the LOC as a proportion of firm assets
COLLAT is binary and indicates the presence of collateral
CV is the vector of control variables (see Table 1 for descriptions)

Note that LOCG COLLAT are dichotomous variables, hence equations (1) and (3) are estimated using a logistic regression procedure. Ordinary least squares regressions will be used for the other two equations. In this study, the existence of simultaneity among the variables was confirmed using the Hausman test before proceeding to use a two stage least squares (2SLS) approach as employed by Brick and Palia (2007). Each of the four hypothesis variables will be regressed on all the exogenous variables in the model. In the second step, the predicted values from these first-stage regressions will be used as independent variables, replacing their respective original variables in the right hand side of equations (1)-(4). Variables not found to be consistently significant in the initial regressions are omitted from the second stage analysis.

Data

The data source is the 2003 Surveys of Small Business Finances (SSBF), available from the US Federal Reserve Board. A total of 4,240 firms and 1,972 variables are included in the survey. The data was collected over several months during the year. For this study, only firms whose most recent loan was a line of credit are included in the analysis. Thus term loans are excluded. Mach and Wolken (2006) report that 34.3% of firms in the 2003 survey have LOCs. The definitions of variables used in this study are provided in Table 1. Variables with missing, extreme, or illogical values (e.g. a negative cash balance) were excluded from the analysis.

Table 2 provides descriptive statistics for the variables used. There are approximately 1,460 observations in the data set. Approximately 63.7% of all LOCs have loan guarantees. The average initial interest rate is 5.55%. The mean term to maturity is just under 31 months. The average size of the LOC scaled by total assets is 66.1%. The average age of the firms in the sample is 17+ years. On average, each borrowers does business with 3.9 lenders. Approximately 80% of the firms have some form of limited liability, such as, subchapter S, C, or LLC's. Collateral was required in 51% of the loans, while compensating balances were required on less than 9% of the LOCs.

Table 1: Variable Definitions

Dependent Variables	
LOCG	binary variable indicating a guarantee (1 = present)
RATE	nominal initial interest rate charged for line of credit
LSIZEP	dollar value of the line of credit divided by total assets
COLLAT	binary variable indicating collateral (1 = required)
2SLS Instrumental Variables	
LOCG_I	Instrument for LOCG
RATE_I	Instrument for RATE
LSIZEP_I	Instrument for LSIZEP
COLLAT_I	Instrument for COLLAT
Control Variables	
RATEOVRINDEX	initial interest rate premium over index used
FEES	Fees imposed as % of loan
FSIZE	natural log of firm's assets
EMPLOY	number of full-time employees in survey year
LEVERAGE	ratio of debt to total assets
CASH	ratio of cash to total assets
PPE	ratio of net depreciable assets divided by total assets
INC	net income divided by sales
OPINC	operating profit divided by sales
NUMLOC	number of lines of credit for the firm
TERM	term of the line of credit in months
FAGE	age of the firm in years
FIXED	binary variable indicating fixed interest rate (1 = fixed)
DISTANCE	distance in miles between firm and lender
RELATE	length of the firm's relationship with lender in years
LIMLIAB	binary variable indicating limited liability legal form
OWNMGR	binary variable indicating presence of owner/manager
NINST	number of financial institutions used by the firm
GRANTPCT	ratio of amount granted divided by amount requested
Industry	7 dummy variables for two digit SIC code groups (8 total)

For 83% percent of the firms the owner and the manager of the firm are the same individual. Binary variables were used to capture the industry sector based on 2-digit SIC codes. Of the industries represented, 1% were in the mining industry, 8.2% in construction, 15.8% in manufacturing, 4.1% in transportation, 8.6% in wholesale, 16.4% in retail, 42.5% in insurance, and 3.4% in the general services sector. None of the firms had previously filed for bankruptcy and none had been delinquent on previous loans. The preponderance of the LOCs were established during 2003, with only a few exceptions. Small businesses, as defined by the U.S. government, are those having fewer than 500 employees. In the final sample, the average business has 52 employees and assets of $6.2 million.

EMPIRICAL RESULTS

As discusses earlier, there are four dependent endogenous variables of interest: the presence of a loan guarantee (LOCG) and loan collateral (COLLAT), the size of the loan as a proportion of total firm assets (LSIZEP), and the initial interest rate (RATE) on the LOC. Employing a 2SLS approach, Tables 3-6 present the results of the four second-stage regressions where one endogenous variable serves as the dependent variable and three remaining endogenous variables are represented by instrumental variables generated in the three first-stage regressions. (Note that the instrumental variables are identified by the name of the endogenous variable followed by an underscore and the letter "I". For example, the instrument for the collateral variable is indicated by COLLAT_I).

Table 2: Summary Statistics

Variable	N	Mean	Standard Deviation	Minimum	Maximum
LOCG	1460	0.637	0.481	0.0	1.0
RATE	1460	5.548	2.405	0.0	20.9
LSIZEP	1450	0.661	1.404	0.0	12.3
FSIZE	1450	13.445	2.205	7.6	19.1
COLLAT	1460	0.507	0.500	0.0	1.0
LEVERAGE	1450	0.685	1.236	0.0	14.6
FEES	1460	0.007	0.019	0.0	0.2
CASH	1405	0.139	0.211	0.0	1.0
INC	1450	0.038	1.731	-29.0	1.7
TERM	1262	30.99	46.08	0.0	432.0
FAGE	1460	17.171	13.168	1.0	99.0
NINST	1460	3.873	2.023	1.0	13.0
GRANTPCT	1460	1.125	1.016	0.1	12.5
RELATE	1460	76.346	98.031	0.0	600.0
LIMLIAB	1460	0.798	0.402	0.0	1.0
FIXED	1460	0.273	0.445	0.0	1.0
DISTANCE	1460	14.064	76.486	0.0	1110.0
COMPBAL	1460	0.089	0.285	0.0	1.0
EMPLOY	1460	51.772	77.664	1.0	486.0
RATEOVRINDEX	1459	1.203	1.622	-1.5	12.0
PPE	1450	0.324	0.288	0.0	1.0
OWNMGR	1415	0.830	0.375	0.0	1.0
NUMLOC	1460	0.182	0.843	0.0	7.0
MINE	1460	0.010	0.101	0.0	1.0
CONST	1460	0.082	0.275	0.0	1.0
MANUF	1460	0.158	0.364	0.0	1.0
TRANS	1460	0.041	0.199	0.0	1.0
WHOLE	1460	0.086	0.280	0.0	1.0
RETAIL	1460	0.164	0.371	0.0	1.0
INSURE	1460	0.425	0.494	0.0	1.0
Assets	1460	6,243,037	21,430,888	0.0	190,741,345
trading	1460	0.103	0.241	0.0	2.3
liaboverassets	1450	0.996	1.500	0.0	14.7
ROA	1450	0.778	3.359	-6.3	45.6
Quick	1240	18.820	176.485	-41.2	2754.0
cashovrassets	1450	0.131	0.216	-0.7	1.0

Table 2 provides the mean, standard deviation, minimum, and maximum values for each of the variables.

In Table 3, the dependent variable is LOCG. Independent variables include three instruments for collateral, rate, and size. None of the three endogenous instrumental variables are statistically significant. If collateral and loan guarantees serve as substitutes one would expect to see a statistically significant negative coefficient, and if they are complements a statistically significant positive coefficient would be expected. While the coefficient on COLLAT_i is positive it is not statistically significant suggesting the presence of collateral does not impact the probability for a loan guarantee. Thus, the empirical results fail to support the notion that collateral serves as either a close substitute or complement for a loan guarantee. On the other hand, the following factors significantly increase the probably that a loan will have a guarantee: 1) greater use of leverage (LEVERAGE), 2) an increase in the number of lending institutions a borrower utilizes (NINST), greater geographic distance from the lender (DISTANCE), the borrower has

limited liability (LIMLIAB), and the loan carries a compensating balance requirement (COMBAL). Alternatively, the following factors reduce the likelihood of loan guarantees: 1) the larger the firm (FSIZE), the greater the firm's cash balances (CASH), the longer the lending relationship (RELATE), the LOC carries a fixed interest rate (FIXED), and the greater the level of fixed assets owned by the firm (PPE). In terms of prediction accuracy, the logistic regression produced a concordant ratio of 76.5%, a discordant ratio of 23.3% and concordant to discordant ratio of 3.3, with virtually no ties.

Table 3: Logistic Regression (Stage 2) with Collateral as Dependent Variable

Parameter	Expected Sign	Estimate	Wald Chi-Square	Significance
Intercept		1.636	1.426	
COLLAT_I	-	0.457	0.544	
RATE_I	-	0.055	0.211	
LSIZEP_I	+	-0.123	1.033	
FSIZE		-0.223	9.801	***
LEVERAGE		0.480	8.960	***
FEES		4.941	0.605	
CASH		-1.210	4.502	**
INC		0.219	0.298	
TERM		0.003	1.592	
FAGE		0.020	8.639	***
NINST		0.187	16.458	***
GRANTPCT		0.224	5.715	**
RELATE		-0.002	6.768	***
LIMLIAB		1.393	30.310	***
FIXED		-1.233	18.316	***
DISTANCE		0.011	5.430	**
COMPBAL	+	0.572	2.568	*
EMPLOY		-0.004	12.655	***
RATEOVRINDEX		-0.061	0.611	
PPE		-1.136	7.846	***
OWNMGR		-0.050	0.058	
NUMLOC		-0.108	1.038	
Concordant (%)	76.5		Somer's D	0.532
Discordant (%)	23.3		Gamma	0.533
Ties (%)	0.2		Tau - a	0.242
Pairs	226850		c	0.766

*significance denoted by ***, **, * for the 1%, 5%, and 10% level, respectively. This table presents the results of a second stage logistic regression where LOCG (presence of a loan guarantee) is the dependent variable. The estimated equation is:* : $LOCG = \alpha_{11} + \beta_{11}RATE\_I + \beta_{12}LSIZEP\_I + \beta_{13}COLLAT\_I + \beta_{1n}CV + \varepsilon_1$ *Where: RATE_I is the instrument for initial interest rate for the line of credit, LSIZEP_I is the instrument for the size of the line of credit as a proportion of firm assets, COLLAT_I is binary and is the instrument indicating the presence of a collateral requirement, and CV is the vector of control variables.*

In Table 4, COLLAT is regressed on the other three instrumental endogenous variables as well as the remaining independent variables. In this case all three endogenous variables are statistically significant. As mentioned above, in Table 3 the presence of collateral had no impact on the likelihood of the borrower posting a personal guarantee. In contrast, Table 4 indicates that the presence of a loan guarantee (LOCG_I) serves to reduce the likelihood of collateral being pledged against the loan. Thus, while theory would suggest that both collateral and guarantees potentially reduce the loss given default on a loan, and hence, one may substitute for the other, the evidence presented in Table 4 suggest that the relationship is asymmetric. That is, loan guarantees appear to serve as a substitute for collateral but collateral is not a substitute for a personal loan guarantee. As mentioned previously, with a guarantee the borrower is likely pledging his or her personal assets, while with collateral corporate assets are being pledged. Thus, the results suggest that in some sense, guarantees represent a higher form of security than collateral. The coefficient on the loan rate (RATE_I) is also negative suggesting collateral is implicitly priced since the borrower may reduce the loan rate by posting collateral. On the other hand, the size of the loan (LSIZEP) is positively related to the use of collateral suggesting that the lender is attempting to reduce loss given default as the size of the LOC increases. Among the remaining variables the following are positively related to the use of collateral: 1) greater firm profitability (INC), longer the loan maturity (TERM), the greater the age of the firm (FAGE), distance from borrower (DISTANCE), and the use of compensating balances (COMPBAL). The factors which tend to reduce the likelihood of using collateral are: 1) the excess of the loan over the requested loan amount (GRANTPCT), the length of the lending relationship (RELATE), the number of full-time employees (EMPLOY), the level of fixed assets (PPE), and the number of number of lines of credit outstanding (NUMLOC). In terms of accuracy, the percent of concordant observations is 79.5%, the percent of discordant observations is 20.4%, and a concordant to discordant ratio of 3.9, with virtually no ties.

Table 4: Logistic Regression (Stage 2) with Collateral as Dependent Variable

Parameter	Expected Sign	Estimate	Wald Chi-Square	Significance
Intercept		-0.004	0.000	
LOCG_I	-	-0.950	3.310	*
RATE_I	-	-0.483	17.447	***
LSIZEP_I	+	0.405	10.437	***
FSIZE		0.195	6.598	**
LEVERAGE		0.021	0.063	
FEES		7.578	1.443	
CASH		-0.445	0.668	
INC		1.289	11.714	***
TERM		0.007	8.235	***
FAGE		0.013	3.787	*
NINST		0.063	1.886	
GRANTPCT		-0.352	8.514	***
RELATE		-0.003	9.795	***
LIMLIAB		-0.169	0.330	
FIXED		0.372	1.577	
DISTANCE		0.025	15.021	***
COMPBAL	+	1.121	9.448	***
EMPLOY		-0.003	5.094	**
RATEOVRINDEX		-0.031	0.177	
PPE		-1.332	12.483	***
OWNMGR		-0.224	1.090	
NUMLOC		-0.198	3.283	*
Concordant (%)	79.5		Somer's D	0.591
Discordant (%)	20.4		Gamma	0.591
Ties (%)	0.1		Tau - a	0.292
Pairs	246078		c	0.795

This table presents the results of a second stage logistic regression where COLLAT (indicating presence of a collateral requirement) is the dependent variable. The estimated equation is: $COLLAT = \alpha_{11} + \beta_{11}RATE\_I + \beta_{12}LSIZEP\_I + \beta_{13}LOCG\_I + \beta_{1n}CV + \varepsilon_1$ *Where: RATE_I is the instrument for initial interest rate for the line of credit, LSIZEP_I is the instrument for the size of the line of credit as a proportion of firm assets, LOCG_I is binary and is the instrument indicating the presence of a loan guarantee, and CV is the vector of control variables. Significance denoted by ***, **, * for the 1%, 5%, and 10% level, respectively.*

In Table 5, the loan rate (RATE) is regressed on the other three endogenous variables and the remaining independent variables. Consistent with the asymmetric relationship between loan guarantees and collateral mentioned above, the loan guarantee (LOCG_i) is negatively related to the loan rate while the loan collateral is not. As mentioned earlier the presence of a loan guarantee reduces loss given default (LGD), which is a component in the risk premium a bank incorporates into the loan rate. Firm size (FSIZE) and the loan rate are negatively related suggesting that larger firms have greater bargaining power. Of the remaining explanatory variables the following have a positive and significant relationship with the loan rate: 1) loan fees (FEES), 2) length of the lending relationship (RELATE), fixed interest rate (FIXED), interest rate premium over the market rate index (RATEOVRINDEX), if the manger and owner are the same (OWNMGR), and the number of lending relationships used by the firm (NINST). The following variables are negatively related to the loan rate: 1) firm profitability (INC), 2) length of the loan (TERM), and 3) the total number of full-time employees (EMPLOY). While it may seem surprising that the longer the banking relationship the higher the interest rate, the "hold-up" theory of the lending relationship suggests that banks often attempt to extract economic rents from their long time customers. As the lending relationship matures both the borrower and especially the lender have invested considerable time and effort to develop the relationship. The durability of this relationship reflects a form of "implicit capital" both parties have invested. The lender in particular is interested in maximizing the return on this investment, and hence attempts to extract economic rents in the form of higher loan rates. The adjusted R-square and F-value for the model are 0.41 and 22.9, respectively.

Table 5: OLS Regression with Interest Rate as Dependent Variable

Variable	Expected Sign	Parameter Estimate	t Value	Significance
Intercept		1410.404	8.82	***
COLLAT_I	-	0.337	0.8	
LOCG_I	-	-0.872	-2.46	**
LSIZEP_I	?	-0.063	-0.82	
FSIZE		-0.263	-5.13	***
LEVERAGE		-0.031	-0.54	
FEES		27.141	7.39	***
CASH		-0.149	-0.38	
INC		-0.577	-2.14	**
TERM		-0.004	-2.81	***
FAGE		-0.006	-1.42	
RELATE		0.002	2.89	***
LIMLIAB		-0.256	-1.24	
FIXED		1.501	8.72	***
DISTANCE		-0.002	-1.56	
COMPBAL	?	0.262	1.1	
EMPLOY		-0.002	-2.52	**
RATEOVRINDEX		0.341	7.02	***
PPE		0.321	1.19	
OWNMGR		0.319	2.15	**
NUMLOC		-0.017	-0.22	
NINST		0.138	4.32	***
GRANTPCT		0.052	0.81	
Adj. R-squared		0.41		
F statistic		22.86		***

*This table presents the results of a second least squares (2SLS) regression where RATE (initial interest rate). The estimated equation is: : RATE = α_{11} + β_{11}LOCG_I + β_{12}LSIZEP_I + β_{13}COLLAT_I + β_{1n}CV + ε_1 Where: LOCG_I is the instrument for the presence of a loan guarantee, LSIZEP_I is the instrument for the size of the line of credit as a proportion of firm assets, COLLAT_I is binary and is the instrument indicating the presence of a collateral requirement, and CV is the vector of control variables. Significance denoted by ***, **, * for the 1%, 5%, and 10% level, respectively.*

In Table 6, loan size as a percent of total firm assets (LSIZEP) is regressed on the other three endogenous variables. Both loan guarantee (LOCG_I) and loan rate (RATE_I) are negatively related to loan size. This may be explained by the fact that small borrowers requesting smaller loans are less diversified and hence potentially riskier, leading to both higher interest rates and a greater use of personal loan guarantees. Once again, it appears that there is an asymmetric relationship between loan guarantees and collateral, with guarantee having the stronger impact (Note that the coefficient collateral is negative but not statistically significant). Among the other explanatory variables the following have a positive relationship with loan size: 1) firm leverage (LEVERAGE), 2) loan fees (FEES), 3) firm profitability (INC), 4) limited liability (LIMLIAB), 5) number of employees (EMPLOY), and 6) the number of lending relationships (NINST). Among the explanatory variables with a negative relationship with loan size are: 1) the length of the lending relationship (RELATE), and 2) and the interest rate premium over the market rate index (RATEOVRINDEX). Once again there is evidence of a “hold-up” effect as demonstrated by the negative relationship between loan size and the durability of the lending relationship. One way for the lender to extract economic rents from the relationship is to make not only higher priced loans but to reduce the size of the loan. This limits the lenders risk at the expense of the borrowers financing needs. The adjusted R-square and F-value for the model are 0.32 and 17.2, respectively.

Hypothesis H1 indicates that loan guarantees lower the interest rate charged. The results indicate that the presence of a loan guarantee is in fact associated with a lower rate of interest, however, when loan guarantee is the dependent variable, the loan rate is not significant. The follow-on statement in H1states that collateral lowers the interest rate is weakly supported. The presence of collateral does not significantly affect the interest rate when the loan rate is the dependent variable. However, higher interest rates are associated with a lower likelihood of collateral use when collateral is the dependent variable.

Hypothesis H2, which states that lines of credit will be larger in the presence of a loan guarantee can be rejected. The coefficient on loan guarantees (LOCG_I) is negative and statistically significant where loan size is the dependent variable. In this case, loan guarantees appear to be associated with smaller, perhaps riskier loans. Consistent with this explanation, loan guarantees are associated with higher leverage. In a related fashion, hypothesis H2 also states that lines of credit will be larger when collateral is required. The insignificant empirical results suggest that the presence of collateral does not explain the size of the loan when loan size is the dependent variable. However, larger loans increase the probability that collateral will be required when COLLAT is the dependent variable. Consistent with Chakraborty and Hu (2006), the length of the banking relationship is significant is all the regressions. A longer relationship is associated with a lower probability of both a loan guarantee and collateral requirements, but is associated with higher interest rates and smaller lines of credit, which may indicate that banks are trying to earn economic rents from their long-term borrowers. However, the estimates suggest the practical effect is minimal as the coefficients are all quite small.

Table 6: OLS Regression with Loan Size as the Dependent Variable

Variable	Expected Sign	Parameter Estimate	t Value	Significance
Intercept		4.965	9.14	***
COLLAT_I	+	-0.341	-1.43	
LOCG_I	+	-0.815	-3.96	***
RATE_I	?	-0.182	-3.84	***
FSIZE		-0.270	-9.27	***
LEVERAGE		0.305	9.86	***
FEES		10.543	4.1	***
CASH		-0.232	-0.99	
INC		0.384	2.44	**
TERM		-0.001	-0.58	
FAGE		0.002	0.79	
RELATE		-0.001	-2.94	***
LIMLIAB		0.576	4.71	***
FIXED		-0.230	-1.82	*
DISTANCE		0.002	1.93	
COMPBAL	?	0.083	0.59	
EMPLOY		0.001	2.67	***
RATEOVRINDEX		-0.064	-2.01	**
PPE		-0.024	-0.15	
OWNMGR		-0.070	-0.81	
NUMLOC		-0.009	-0.2	
NINST		0.034	1.78	*
GRANTPCT		0.036	0.95	
Adj. R-squared		0.32		
F statistic		17.2		***

This table presents the results of a second least squares (2SLS) regression where LSIZEP (size of line of credit over assets). The estimated equation is: $LSIZEP = \alpha_{11} + \beta_{11}LOCG\_I + \beta_{12}RATE\_I + \beta_{13}COLLAT\_I + \beta_{1n}CV + \varepsilon_1$ *Where: LOCG_I is the instrument for the presence of a loan guarantee, RATE_I is the instrument for the initial interest rate for the line of credit, COLLAT_I is binary and is the instrument indicating the presence of a collateral requirement, and CV is the vector of control variables. Significance denoted by ***, **, * for the 1%, 5%, and 10% level, respectively*

Furthermore, loan guarantees appear to be used more frequently by limited liability firms and are also used more frequently by more highly leveraged firms. On the other hand, longer banking relationships are associated with less frequent use of guarantees. The interest rate and size of the line of credit offer no significant explanation for the presence of a loan guarantee. The use of collateral also does not explain the use of loan guarantees. The interest rate charged is lower in the presence of a loan guarantee, but is not significantly affected by the use of collateral or compensating balances. Loan guarantees are associated with smaller loans, possibly an indication of lower credit quality. It appears that lower credit quality is addressed though the use of loan guarantees and by limiting the size of lines of credit granted.. In this case, loan size and guarantees appear to be complementary. This provides evidence that credit rationing is taking place

CONCLUSION

In our research, loan guarantees are found to have a negative effect on the size of loans and also a negative effect on the interest rate of the loans. There is some evidence that loan guarantees and collateral are asymmetric substitutes as the presence of a loan guarantee lowers the likelihood of a collateral requirement but the opposite is not true. Collateral does not appear to be substitute for land guarantees. Furthermore, measures of liquidity and leverage affect the use of loan guarantees, while they do not significantly affect the use of collateral. The presence of more fixed assets lowers the likelihood of both loan guarantees and collateral. Both loan guarantees and collateral are explained, in part, by the ratio of the amount of credit granted to that applied for. However, the signs are different, so loan guarantees are more probable as the loan amount increases while collateral requirement are less likely. Perhaps this is once again a reflection that the two are substitutes. The variable GRANTPCT suggest that there is more room to bargain with collateral requirements and loan guarantees than interest rates or the final size of the line of credit.

As reported by Brick & Palia (2007), there is some evidence of simultaneity among the terms of lending which if not accounted for may provide inconsistent results. Brick & Palia (2007) and others examine the effects of the strength of the lending relationships on the terms of lending. Various authors have found little or no significant effect. In this research, the length of the lending relationship is considered a proxy for the strength of the relationship. Furthermore, the model includes an additional variable, which reflects the number of lending relationships a firm relies upon. If both variables measure an important aspect of the lending relationship, their signs should be opposite. Holding all else constant, a longer relationship is presumed to indicate a stronger relationship, while a greater number of lending relationships might suggest a weaker relationship. The empirical evidence suggests that multiple banking relationships do in fact reflect a weaker lending relationship. Furthermore, for loan guarantees a longer (stronger) lending relationship is associated with a lower probability of a guarantee. For collateral, only the length of the relationship is significant, but it too indicates that a longer relationship is associated with a lower probability of collateral. In the case of the loan rate, the two variables have the same sign, while in the loan size equation a stronger relationship is associated with smaller loans, contrary to what might be expected. As mention in the beginning, the precise terms of any given loan reflect the results a complex set of negotiation between the borrower and the lender where various trade-off exist between the individual terms of lending.

REFERENCES

Brick, I. and Palia, D. (2007). Evidence of Jointness in the terms of relationship lending. *Journal of Financial Intermediation*. 16, 452 – 476.

Camino, D., and Cardone, C. (1999). The Valuation and Cost of Credit Insurance Schemes for SME: The Role of Loan Guarantees. *International Small Business Journal*, 17, 13–31.

Chakraborty, A. and Hu, C. (2006). Lending relationships in line-of-credit and non-line-of-credit loans; Evidence from collateral use in small business. *Journal of Financial Intermediation*, 15, 86 – 107.

Cowling, M., and Mitchell, P. (2003). Is the Small Firms Loan Guarantee Scheme Hazardous for Banks or Helpful to Small Business. *Small Business Economics*, 21, 63-72.

Doh, T., and Ryu, K. (2004). Analysis of Loan Guarantees among the Korean Chaebol Affiliates. International Economic Journal, 18, 161 –178.

Glennon, D. and Nigro, P. (2005) Measuring the Default Risk of Small Business Loans: A Survival Analysis Approach. *Journal of Money, Credit & Banking*, 37, 923-947.

Mach, T. and Wolken,J. (2003). Financial Services Used by Small Businesses:
Evidence from The 2003 Survey of Small Business Finances. Federal Reserve Bulletin, 92, A167-195.

Petersen, M., and Rajan, R. (1994). The Benefits of Lending Relationships: Evidence from Small Business Data. *Journal of Finance*, 49, 3-37

Riding, A. and Haines Jr., G.(2001). Loan Guarantees: Cost of Default and Benefits to Small Firms. *Journal of Business Venturing*, 16, 595 – 613.

Stiglitz, J. and Weiss,A. (1981). Credit Rationing in Markets with Imperfect Information. *American Economic Review*, 71 Issue, 393 – 411.

BIOGRAPHY

Dr. Alan K. Reichert is a Professor of Finance at Cleveland State University. He can be contacted at Department of Finance, College of Business, Cleveland State University, 2121 Euclid Avenue, Cleveland, Ohio 44115. Email: a.reichert@csuohio.edu

Dr. Ray Posey is Department Chair and Professor of Business Administration, Mount Union College. He can be contacted at Department of Business Administration , Mount Union, Ohio, Alliance, Ohio 44601. Email: Poseyra@muc.edu

ON THE PRICING OF DUAL CLASS STOCKS: EVIDENCE FROM BERKSHIRE HATHAWAY

Ling T. He, University of Central Arkansas
K. Michael Casey, University of Central Arkansas

ABSTRACT

This study focuses on determining whether short-term market inefficiencies exist that can be periodically exploited by investors. Berkshire Hathaway's dual class stock with differential voting rights and one- way conversion option provides a unique opportunity to investigate this issue while controlling for other exogenous variables that could bias the findings. Given the investor attention directed toward Berkshire Hathaway, and the company's famous CEO Warren Buffett, this company's stock should always trade in an efficient market. The results suggest that Berkshire Hathaway class B shares tend to have significantly higher opening prices and Berkshire Hathaway class A shares tend to have higher closing prices, although both A and B shares have similar average daily returns. Price dynamics may create unique arbitrage opportunities for investors. However, the higher overnight returns for B shares may be offset by higher volatility embedded in the B shares.

JEL: G11; G12; G14

KEYWORDS: Dual class stock, market efficiency, asset pricing, volatility

INTRODUCTION

Berkshire Hathaway's dual classes of common stock with differential voting rights and one-way convertibility provide a unique opportunity to study market efficiency in the short run. Both class A and class B shares are based on the same corporate fundamentals but class A shares are convertible to 30 shares of class B stock. However 30 class B shares can never be converted to one share of class A stock. Holding everything else constant, class B shares should trade for exactly 1/30th of class A's stock price.

In addition to the conversion differences class B shares carry lower voting rights with each class B share voting at only 1/200th of its class A counterpart. In other words an investor holding 30 shares of class B stock only possesses 15 percent of the voting power of one class A share even while owning the same fraction of the company. Since several studies including Megginson (1990) and DeAngelo and DeAngelo (1985) maintain that shares of stock with superior voting rights sell at a premium the expectation is that class B shares should always trade at a slight discount to class A shares. The inferior voting rights should keep class B shares trading at a lower price than its fractional class A value but arbitrage will also keep the prices closely in line. If class B shares increase too high relative to class A then class A shareholders will convert and sell class B pushing the price back to equilibrium with class A. In addition, both classes of stock should share the same risk characteristics. Given sufficient adjustment time we fully expect these price and risk relationships to hold. However, what about in the short run? Are there opportunities for profit that exist for alert day-traders? In this study we investigate whether Berkshire Hathaway class A and class B stock maintains the expected price and risk relationship in the very short run.

The purpose of this paper is to further investigate short-run market efficiency issues. Given the ubiquitous nature of short-term traders it would be useful to see if temporal market inefficiencies do indeed exist that short-term traders can arbitrage for profit. Jordan and Diltz (2003) in their study of 324 day traders find that opportunities for short-term trading profits do exist. Their findings indicate that 36 percent of day traders make some money and approximately 20 percent of day traders were marginally profitable. However there is no evidence to indicate whether the profits were due to momentum strategies as Jordan and Diltz's (2003) findings suggest or actual short-term market inefficiencies. Using Berkshire Hathaway's dual class stock in this study enables us to focus solely on the issue of whether short-term market inefficiencies do indeed periodically exist even for a widely followed company.

The remainder of the paper is organized in the following manner. In section two we provide a brief discussion of the relevant literature. Section three provides information on data collection, methodology, and a presentation of the various models used in this study. In section four we discuss the empirical results and in section five we provide some concluding remarks with suggestions for future research.

LITERATURE REVIEW

Several studies use a single firm as an opportunity to evaluate certain issues and simultaneously control for other exogenous variables. Perhaps the most famous series of studies involves Citizens Utilities Company. Citizens Utilities offered two classes of common stock that differed based on dividend payout. Class A shares received stock dividends while Class B shares received cash dividends. This unique arrangement provides a controlled laboratory for finance researchers to study dividend relevance issues and the impact of taxes on dividend policy. The Citizens Utilities Company was the sole data source for several studies investigating this issue further including Long (1978), Poterba (1986), Sterk and Vandenberg (1990), and Hubbard and Michaely (1997).

Another single-firm study used Berkshire Hathaway returns due to the fact that the company's Chief Executive Officer, Warren Buffet, is considered to be an investment genius by many people in the investing community. Christopherson and Gregoriou (2004) look at a number of macroeconomic factors and other market variables in an attempt to develop a model forecasting Berkshire Hathaway's returns and provide additional detail on the various investment metrics utilized by Buffet. For the purposes of this study the widespread investor focus on Berkshire Hathaway stock should contribute to greater price efficiency of the company. If short-term price inefficiencies do exist for Berkshire Hathaway these inefficiencies should be even greater, or occur with greater frequency, for companies with thinner market followings.

The dual class stock literature provides a unique opportunity to evaluate a number of financial and managerial issues. Several of these studies look at voting issues related to differential voting rights often assigned to different classes of a company's stock. Jensen and Meckling's (1976) agency theory paper suggests that the separation of ownership and control will result in management consuming excess perquisites unless some monitoring mechanism prevents them from doing so. The vote assigned to common stock is one such mechanism. As such, voting rights have value to shareholders because it affords them the opportunity to control the board and thereby exert pressure on management to behave in a manner consistent with shareholder wealth maximization.

According to Swisher (2006) the dual class structure is often adopted to allow managers and/or original owners to raise equity and simultaneously maintain control through retention of superior voting shares. Swisher's study specifically evaluates stock returns of companies with dual classes of common stock and determines that contrary to Dann and DeAngelo (1988) the stock of firms with dual class offerings does not trade at a discount. The study postulates that management with voting control may have greater freedom to make long-term decisions instead of succumbing to investor pressure for less optimal short term decisions.

Smith and Amoako-Adu (1995) studied dual class shares listed on the Toronto Stock Exchange to determine whether shares with superior voting rights traded at a premium to their paired inferior voting right shares. Their findings indicate that investors do assign a slight premium to voting rights. DeAngelo and DeAngelo (1985) and Megginson (1990) provide consistent results of voting power commanding a premium. Hauser and Lauterbach (2004) approached the value of voting rights from a different perspective. Their study uses data from dual class reunifications where firms recapitalized their dual class stocks into one class of common equity. Shareholders with superior voting rights were compensated in most cases with additional shares of the new equity. The size of the "share compensation" was directly related to family controlled firms and inversely related to institutional holdings. However, the higher the vote concentration lost during the reunification, the higher the additional share compensation.

Ang and Megginson (1989) compiled results from five U.S. studies on dual class premiums and reported that the average premium paid to superior voting rights shareholders was 5.4 percent. The five studies included DeAngelo and DeAngelo (1985), Jarrel and Poulsen (1988), Lease, McConnell, and Mikkelson (1983 & 1984), and Partch (1987). Nenova (2003) conducts a cross-country study using 661 dual class firms from 18 different countries. Nenova (2003) determines that legal differences, takeover regulations, and other country specific issues explain only about two-thirds of the price differential between dual class shares. While the average price differential varies substantially depending on the country it does appear to exist in the 18 countries included in this study.

One study by Robinson, Rumsey, and White (1996) focuses on dual class equity and concludes that voting rights do help explain price differentials but investors also require a "significant time period to assess and incorporate into prices the information contained in series of complex events." Foerster and Porter's (1993) study provides some support for this finding in their result that the premium assigned to superior voting shares is not constant over time. Since the literature consistently supports the value associated with common stock voting rights we would expect Berkshire Hathaway class A shares with superior voting rights to trade at a slight premium over class B shares. However, given the adjustment period identified in Robinson, Rumsey, and White (1996) and the temporal fluctuations identified by Foerster and Porter (1993) this expected premium may not persist at all times.

A study by Froot and Dabora (1999) that focuses on trade location finds that the level of market activity can impact price. Their study evaluated the price behavior of three 'Siamese twin' companies that trade in different markets. Since the fundamentals are identical one would expect the asset prices to be identical. However, even after controlling for exchange rate differentials, differences in dividend income, and taxes they find that price differentials continue to exist between 'twin' firms traded in different markets. One noticeable difference in these firms was level of market activity from one location to another. Firms with more active markets resulted in higher prices. The authors conclude that some market segmentation does exist but are unable to pinpoint the primary cause. These results might suggest that Berkshire Hathaway Class A and Class B shares might exhibit some price differentials during trading hours with lower volume and prices might converge during higher volume trading periods.

Volatility issues surrounding overnight trades are also of interest. Do investors perceive one class of Berkshire Hathaway stock to have greater risk than the other class? Since risk should be associated with the expectation of cash flows one would expect both Class A and Class B shares to exhibit similar volatility. However research does support volatility differences in overnight trades versus daytime trades of the same stock. Amihud and Mendelson (1987) look at the 30 stocks in the Dow Jones Industrial Average and find greater return volatility in open-to-open trades versus close-to-close trades. Another study by George and Hwang (1995) finds similar results in the Japanese market. Oddly, this return volatility is not exhibited in companies with lower trading volume. Zhang et al (2007) conducts a similar study using Chinese stocks and finds volatility differences exist for the same stock when looking at open-to-open returns versus close-to-close returns. Kim and Kim (2007) evaluate return and volatility issues in different markets using dual-listed stocks. Daytime and overnight returns are evaluated for 114 different stocks. Their findings indicate that price and volatility spillover is stronger when the stock listed on the overseas market opens trading on the overnight U.S. ADR market.

Ulibarri (1998) finds that after hours price changes and changes in volume are due to the release of new information after the markets closed. Consistent with Ulibarri (1998) much of the volatility difference in each of these studies could be attributed to the release of new information after trading in the home market has ended for the day. In any case, the authors are aware of no study to date that evaluates overnight volatility differences between dual classes of common stock issued by the same company.

Since Berkshire Hathaway is a U.S. listed company we would expect minimal overnight differences in both returns and volatility unless relevant new information is released. However, we would expect no differences to exist in the reaction to new information of Class A stock and Class B stock in either returns or volatility. In other words both classes of Berkshire Hathaway stock should respond in the same manner to the release of new information so price swings and volatility reaction should be consistent in the overnight markets. For these reasons Berkshire Hathaway's dual class stocks with large investor followings provide a unique opportunity to evaluate market efficiency in terms of both price and volatility.

DATA AND METHODOLOGY

The daily stock prices for Berkshire Hathaway class A and B shares and S&P 500 Stock Index are used in this study. The data are downloaded from Yahoo.com and cover a period of May 9, 1996 through June 30, 2008. When the data are converted into some return ratios, one observation is lost. In addition, trading information for class A shares is missing on six trading days: February, 23, 2000, June 2 and 9, 2000, August 28 and 29, 2000, and February 1, 2002. Therefore, the actual sample used in analysis includes 3,049 observations.

The sample ends ahead of the current economic recession, in order to avoid the possible skewness caused by extreme volatility in stock prices. Both the daily stock prices for Berkshire Hathaway class A and B shares and S&P 500 Stock Index show excessive volatility over the period of July1, 2008 to December 31, 2009. The tremendous volatility altered normal relationships we plan to analyze in this paper. Therefore, we exclude this period in our analysis. In addition to the volatility problem, the class B shares experienced a 50:1 split on January 21, 2010. Even though the split itself cannot change any relationships, it did occur in a volatile time. This is another reason why we did not include any data after June 30, 2008. We use following three return ratios and a volatility ratio to assess risk and return characteristics of A and B shares:

(1). Daily returns, (close price - previous close price)/previous close price, is a measure of total returns between two trading days. It catches information released during a 24-hour period, the previous closure of the stock market to the current closure, in addition to holidays and weekends. In order to differentiate sensitivities of stock prices to day time and overnight information, the daily return ratio is broken into two sub-ratios for day time and overnight returns, respectively.

(2). Daytime returns are measured as (close price – open price)/open price. All information, mainly domestic, released during trading time should be reflected in this ratio.

(3). Overnight returns reflect information available after market closure, mostly from overseas. The ratio is calculated by (open price - previous close price)/previous close price.

(4). Volatility ratio, log (high price)-log (low price), measures the maximum swing in stock prices during a trading day.

All variables are measured in percentage change or growth form and proven to be I(1) by Augmented Dickey-Fuller unit root test (results are available upon request).

For each ratio class A and B shares represent two independent random samples and a test for equality of population means without the assumption of equal variances suggested by Newbold (1995) is conducted. The approximate t-test of equal means is calculated as the following:

$$t_A = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\hat{\sigma}_1^2/n_1 + \hat{\sigma}_2^2/n_2}}, \qquad (1)$$

where, t_A represents the t-statistic, $\bar{x}$ and $\hat{\sigma}^2$ indicate means and variances for class A and B shares.

In order to examine differences in stock market sensitivities of stock returns of class A and B shares, we estimated the following two-equation system:

$$Y_A = \alpha_A + \beta_A M + \varepsilon_A$$
$$Y_B = \alpha_B + \beta_B M + \varepsilon_B$$
$$Test\colon \beta_A = \beta_B \quad , \qquad (2)$$

where Y_A *and* Y_B are daily, daytime or overnight stock returns for class A and B shares, respectively. β_A *and* β_B are class A and B stocks' regression coefficients of stock market, M, represented by percentage changes in S&P 500 Stock Index. The coefficients of stock market measure sensitivities of class A and B shares to the stock market. The result of the t-test can tell if the null hypothesis of equal stock market coefficients for class A and B shares should be accepted or rejected.

We also use the t-test to examine if investors need to pay a premium for more voting rights and one-way conversion privilege attached to the class A shares. The null hypothesis is that the premium equals zero. We calculate and test two types of premiums as follows:

1- Daytime premium = (close price of A – 30*close price of B)/30*close price of B.
2- Open premium = (open price of A-30*open price of B)/30*open price of B.

RESULTS

Compared to class B shares, class A shares have advantages in voting and conversion rights which may be acquired by paying a one-time premium as suggested by our results (Table 1). The premiums paid by class A shareholders for extra voting rights and conversion privilege are significantly different from zero. The result is in line with previous findings that investors have to pay a premium for additional stock voting rights, for example, Smith and Amoako-Adu (1995), Hauser and Lauterbach (2004) and Swisher (2006). Since both class A and B shares are issued by the same company, returns and price volatility in both class A and B shares should not deviate far from each other. Therefore, we hypothesize that class A and B shares share similar return and risk characteristics. The traditional daily return ratio supports our hypothesis. The ratio has a mean of 0.051% for both class A and B shares, and its standard deviations are also close for class A and B shares, 1.444% vs. 1.414% (Table 1). Nevertheless, inconsistency is revealed in intraday changes. Overnight returns for class B shares have a mean of 0.064%, in contrast to 0.027% for class A shares. The difference is significant at the five percent level. However, daytime returns tell a different story. Although the average daytime return rate for class A shares is higher, 0.024%, compared with a -0.012% for class B shares, results of the equality test suggest that there are no significant differences in daytime returns and their variances (Table 1). The results suggest that class B shares tend to have higher opening prices and class A shares tend to have higher closing prices. The stock price behavior may reflect an intraday adjustment due to the stock conversion. As Buffett (2003) points out when the price of class B shares rises above 1/30th of the price of class A shares, investors may buy class A shares and immediately convert them into class B shares to realize arbitrage profits. The increase in the demand for class A shares bids up the class A prices and the conversion of class A to class B shares pushes down the class B prices. The process continues until the arbitrage opportunity disappears. However, if the process is overdone, it may make the class B prices more attractive and thus lead to the higher opening prices for class B shares and eventually another potential arbitrage opportunity.

The higher overnight returns for class B shares may be a reason for investors to buy class B shares at discounted prices (compared to the premium prices for class A shares). However, this benefit may be offset by greater risks involved in the class B shares. The class B shares display much higher volatility than class A shares. The volatility ratio for the class B shares is 1.65 and 1.395 for the class A shares. The difference is significant at the one percent level. Results in Table 1 indicate that the class B share prices are more volatile with much larger trading volumes during the entire trading period, but the average return rate over the entire trading day is almost at or slightly below zero.

Table 1: Summary Statistics (in percent, except for VolumeA and VolumeB): May 10, 1996 through June 30, 2008

Variable	*Mean*	*Std. Deviation*	*Minimum*	*Maximum*
DayA	0.024	1.293	-6.627	8.989
DayB	-0.012	1.309	-6.182	10.462
NiteA	0.027	0.631	-7.647	7.500
NiteB	0.064	0.651	-9.591	8.643
DailyA	0.051	1.444	-7.401	10.227
DailyB	0.051	1.414	-6.771	11.753
VolatilA	1.396	1.197	0.000	10.446
VolatilB	1.642	1.187	0.000	11.248
VolumeA	35849	29589	0	332000
VolumeB	1090600	952380	300	17867000

Equality Tests for A Shares vs. B Shares		
	T-test of equal means	F-test of equal variances
DayA vs. DayB	1.091 (0.275)	1.025 (0.493)
NiteA vs. NiteB	-2.257 (0.024)**	1.064 (0.089)*
DailyA vs. DailyB	0.003 (0.998)	1.043 (0.241)
VolatilA vs. VolatilB	-8.057 (0.000)***	1.018 (0.622)
VolumeA vs. VolumeB	-61.12 (0.000)***	1036.0 (0.000)***

Test of hypothesis: Mean = 0
Mean of Daypre = 0.515, Std. Deviatoin of Daypre = 1.111, t-statistic = 24.154(0.000)***
Mean of Openpre = 0.446, Std. Deviation of Openpre = 1.083, t-statistic = 22.741(0.000)***

*DayA and DayB are day time returns, (close price-open price)/open price, for A and B shares, respectively. NiteA and NiteB are overnight returns, (open -previous close)/previous close, for A and B shares, respectively. DailyA and DailyB are daily returns, (close -previous close)/previous close, for A and B shares, respectively. VolatilA and VolatilB are daily volatilities, log (high price)-log (low price), for A and B shares, respectively. VolumeA and VolumeB are trade volumes for A shares and B shares, respectively. Daypre=(closeA –30*closeB)/30*closeB; Openpre=(openA-30*openB)/30*openB. P-values are in parentheses. *, **, *** indicate significance at the ten, five, and one percent levels, respectively. Although the null hypothesis of equal variances between VolumeA and VolumeB is rejected, the t-statistic and its p-value remain the same as reported in the table. Number of observations is 3049. The following trading dates are deleted, due to lack of trading information for A shares: 2/23/2000, 6/2/2000, 6/9/2000, 8/28/2000, 8/29/2000, and 2/1/2002.*

Table 2 reports sensitivities of class A and B shares to the stock market. We estimate the market model for the three return ratios and volatility ratio. There are no significant differences detected in sensitivities of class A and B shares to the stock market, in terms of daily returns. For daytime returns, class B shares display higher stock market sensitivity than class A shares do, although the difference is marginally significant at the ten percent level. The similar stock market sensitivities of daily and daytime returns for class A and B shares may explain why daily and daytime returns for the class A and B shares are statistically equal (Table1). However, in the case of overnight returns, the constant term for class B shares is 0.001 with a t-value of 5.60, in contrast to that for class A shares of 0.000 with a t-value of 2.48. The larger constant term in the market model suggests that class B shares are more sensitive to the overnight information which may not be reflected in the domestic market portfolio. The result is in line with the Kim and Kim's (2007) finding that stock price and volatility spillover is stronger when the stock listed on the overseas market opens trading on the overnight U.S. ADR market. Moreover, fluctuations in the prices of class B shares demonstrate a significant higher sensitivity to the stock market volatility than class A shares do. The result is not surprising, given the fact that the average volatility ratio for class B shares is significantly higher than that for class A shares (Table 1). In addition, the average daily returns for class A and B shares are virtually same. There is no meaningful financial motivation to convert class A shares into class B shares, unless the arbitrage opportunity mentioned above can bring returns large enough to compensate higher volatility embedded in the class B shares.

Table 2: Sensitivities of A and B Shares to the Stock Market (Independent Variable: S&P 500 Stock Index)

Dependent variable	**Constant**	**Coefficient of DaySP**	**R^2 (%)**
DayA	0.000	0.260	5.09
	(0.72)	(12.79)***	
DayB	-0.000	0.276	5.60
	(-0.88)	(13.45) ***	
T-test of equal coefficients of DaySP: -1.752	P-value: 0.080*		
Dependent variable	Constant	Coefficient of NiteSP	R^2 (%)
NiteA	0.000	1.149	0.08
	(2.48)**	(4.96)***	
NiteB	0.001	1.480	1.25
	(5.60)***	(6.22)***	
T-test of equal coefficients of NiteSP: -2.074	P-value: 0.038**		
Dependent variable	Constant	Coefficient of DailySP	R^2 (%)
DailyA	0.000	0.385	9.01
	(1.61)	(17.37)***	
DailyB	0.000	0.387	9.51
	(1.64)*	(17.89)***	
T-test of equal coefficients of DailySP: -0.251	P-value: 0.802		
Dependent variable	Constant	Coefficient of VolatilSP	R^2 (%)
VolatilA	0.006	0.546	14.34
	(16.08)***	(22.59)***	
VolatilB	0.008	0.594	17.28
	(21.18)***	(25.23)***	
T-test of equal coefficients of VolatilSP: -4.435	P-value: 0.000***		

*DayA and DayB are day time returns, (close price-open price)/open price, for A and B shares, respectively. NiteA and NiteB are overnight returns, (open -previous close)/previous close, for A and B shares, respectively. DailyA and DailyB are daily returns, (close -previous close)/previous close, for A and B shares, respectively. VolatilA and VolatilB are daily volatilities, log (high price)-log (low price), for A and B shares, respectively. Variables with names ended with SP are based on S&P 500 Stock Indexes. t-values are in parentheses. *, **, *** indicate significance at the ten, five, and one percent levels, respectively. Number of observations is 3049. The following trading dates are deleted, due to lack of trading information for A shares: 2/23/2000, 6/2/2000, 6/9/2000, 8/28/2000, 8/29/2000, and 2/1/2002.*

CONCLUDING COMMENTS

This paper investigates intraday changes in Berkshire Hathaway's dual class common stocks with differential voting rights and one-way convertibility. The sample used in this study contains 3049 observations over a period of May 9, 1996 through June 30, 2008. We conduct a t-test on the null hypothesis that average premium for obtaining class A shares with additional voting rights and one-way conversion privilege is zero. Our results suggest that investors do pay significant premiums to obtain extra voting rights and one-way conversion privilege embedded in the class A shares. The result is consistent with many previous studies.

We create four series to examine return and risk characteristics of class A and B shares: daily returns, daytime returns, overnight returns, and volatility ratio. While we find that the overall return and risk are priced in an efficient manner for both class A and B shares as evidenced by almost identical daily returns and their variations of the two classes of stocks, our results on intraday prices detect market inefficiencies over short intervals. The results indicate that class B shares tend to have significantly higher opening prices and class A shares tend to have higher closing prices, although both class A and B shares have similar average daily returns. Price dynamics may create arbitrage opportunities for investors.

Investors may buy class A shares at the opening of the stock market when the price of class B shares rises above 1/30th of the price of class A shares. It means acquiring class A shares at relatively low prices. Then the investors can immediately convert acquired class A shares into class B shares to realize arbitrage profits. The increase in the demand for class A shares in morning may bid up the A prices and the conversion of class A to class B shares push down the B prices in the rest of the trading day. The process continues until the arbitrage opportunity disappears. Nonetheless, if the process is overdone, the A prices exceed 30 times of the B prices near the market closure, it may make the B prices more attractive. The strong demand for class B shares may lead to the higher opening prices for class B shares. It may indicate another potential arbitrage opportunity. The intraday inefficiencies in the stock market cannot guarantee feasible arbitrage opportunities which require significant misprices to offset trading costs and tax liabilities.

In addition, the higher overnight returns for class B shares may be counteracted by higher volatility embedded in the class B shares. Results of our two-equation (the market model) system indicate that class B shares are more sensitive to the stock market volatility, compared with class A shares. The above findings are solely derived from a single company. Therefore, the intraday trading strategy discussed in this study is only relevant to Berkshire Hathaway dual listed stocks. Nevertheless, the method of analyzing intraday pricing efficiency may be applied to other companies with dual listings or cross-exchange listings to identify potential patterns of mispricing.

REFERENCE

Amihud, Y. and Mendelson, H. (1987) Trading mechanisms and stock returns: empirical investigation. *Journal of Finance*, 42, 533-553.

Ang, J.S. and Megginson, W.L. (1989) Restricted voting shares, ownership structure, and the market value of dual-class firms. *The Journal of Financial Research*, 12, 301-318.

Buffett, W. (2003) Comparative Rights and Relative Prices of Berkshire Class A and Class B Stock. *Memo, Berkshire Hathaway, Inc*.

Christopherson, R. and Gregoriou, G.N. (2004) Lagged factors affecting Berkshire Hathaway returns. *Journal of Asset Management*, 5, 272-276.

Dann, L. and DeAngelo, H. (1988) Corporate financial policy and corporate control: a study of defensive adjustments in asset and ownership structure. *Journal of Financial Economics*, 20, 87-127.

DeAngelo, H. and DeAngelo, L. (1985) Managerial ownership of voting rights: a study of public corporations with dual classes of common stock. *Journal of Financial Economics*,14, 33-69.

Foerster, S.R. and Porter, D.C. (1993) Dual class shares: are there returns differences? *Journal of Business Finance & Accounting*, 20, 893-903.

Froot, K.A. and Dabora, E.M. (1999) How are stock prices affected by the location of trade? *Journal of Financial Economics*, 53, 189-216.

George, T.J. and Hwang, C.Y. (1995) Transitory price changes and price-limit rules: evidence from the Tokyo stock exchange. *Journal of Financial and Quantitative Analysis*, 30, 313-327.

Hauser, S. and Lauterbach, B. (2004) The value of voting rights to majority shareholders: evidence from dual-class stock unifications. *The Review of Financial Studies*, 17, 1167-1184.

Hubbard, J. and Michaely, R. (1997) Do investors ignore dividend taxation? A reexamination of the Citizen's Utilities case. *Journal of Financial and Quantitative Analysis*, 32, 117-135.

Jarrell, G.A. and Poulsen, A.B. (1988) Dual-class recapitalization as antitakeover mechanisms: the recent evidence. *Journal of Financial Economics*, 20, 129-152.

Jensen, M. and Meckling, W. (1976) Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3, 305-360.

Jordan, D.J. and Diltz, J.D. (2003) The profitability of day traders. *Financial Analysts Journal*, 59, 85-94.

Kim, D. and Kim, D.S. (2007) Return-volatility spillover and foreign operations of dually-listed global firms. *Hitotsubashi Journal of Economics*, 48, 1-24.

Lease, R.L., McConnell, J.J., and Mikkelson, W.H. (1983) The market value of control in publicly-traded corporations. *Journal of Financial Economics*, 11, 439-471.

Lease, R.L., McConnell, J.J., and Mikkelson, W.H. (1984) The market value of differential voting rights in closely held corporations. *Journal of Business*, 57, 443-467.

Long, J.B., Jr. (1978) The market valuation of cash dividends: a case to consider. *Journal of Financial Economics*, 6, 235-264.

Megginson, W.L. (1990) Restricted voting stock acquisitions premiums and the market value of corporate control. *Financial Review*, 25, 175-198.

Nenova, T. (2003) The value of corporate voting rights and control: a cross-country analysis. *Journal of Financial Economics*, 68, 325-351.

Newbold, P. (1995) Statistics for Business and Economics, Fourth Edition, Prentice-Hall.

Partch, M.M. (1987) The creation of limited voting common stock and shareholder wealth. *Journal of Financial Economics*, 18, 313-339.

Poterba, J.M. (1986) The market valuation of cash dividends: the Citizen's Utilities case reconsidered. *Journal of Financial Economics*, 15, 395-405.

Robinson, C., Rumsey, J., and White, A. (1996) Market efficiency in the valuation of corporate control: evidence from dual class equity. *Canadian Journal of Administrative Sciences*, 13, 251-263.

Smith, B.F and Amoako-Adu, B. (1995) Relative prices of dual class shares. *Journal of Financial and Quantitative Analysis*, 30, 223-239.

Sterk, W.E. and Vandenberg, P.A. (1990) The market valuation of cash dividends and the tax differential theory of dividend policy: a case revisited. *The Financial Review*, 25, 441-455.

Swisher, J. (2006) Dual-class companies: do inferior-voting shares make inferior investments? *Mid-American Journal of Business*, 21, 41-48.

Ulibarri, C.A. (1998) Is after-hours trading informative? *The Journal of Futures Markets*, 18, 563-579.

Zhang, Z., Nemiroff, H., Wang, J., and Karim, K. (2007) Transitory price changes in the Chinese stock markets. *Review of Pacific Basin Financial Markets and Policies*, 10, 519-540.

ACKNOWLEDGEMENT

The authors wish to express thanks to two anonymous reviewers and the editor for insightful comments that resulted in significant improvements in the quality of this study.

BIOGRAPHY

Dr. Ling T. He is the Carmichael Professor of Finance at the University of Central Arkansas. He can be contacted at: College of Business, University of Central Arkansas, 201 Donaghey Ave., COB 211L, Conway, State of Arkansas, US. Email: linghe@uca.edu

Dr. K. Michael Casey is the McCastlain Professor of Finance at the University of Central Arkansas. He has published over 75 articles including publications in *Financial Review*, the *Quarterly Review of Economics and Finance*, and the *Journal of Real Estate Finance and Economics*. He can be contacted at: College of Business, University of Central Arkansas, 201 Donaghey Ave., COB 102E, Conway, State of Arkansas, US. Email: mcasey@uca.edu

TRANSACTION COST DISCOVERY BY DECOMPOSITION OF THE ERROR TERM: A BOOTSTRAPPING APPROACH

Ariful Hoque, University of Southern Queensland

ABSTRACT

There is agreement regarding the fundamental role of transaction costs in determining currency options market efficiency. However, the estimation of transaction costs in this relationship is controversial. In this study, a bootstrapping approach is adapted to decompose the error term of the put-call parity regression analysis in order to estimate transaction costs. The currency option market is more than 95 percent efficient with the estimated transaction costs. This robust transaction cost calculation will be valuable to traders and researchers as it eliminates dependence on crude proxies for transaction costs.

JEL: G13; G14

KEYWORDS: Transaction costs, error term decomposition, put-call parity, serial correlation, ARCH

INTRODUCTION

Efficiency is the key factor in the functioning and development of options markets. Further, efficiency represents the equilibrium market price, which can be used as the market's best forecast of the future options price (Hoque et al, 2009). The efficiency of an options market can be investigated by testing the put-call parity (PCP) relationship in the usual setting where the market is assumed to be frictionless. The PCP is a no-arbitrage relationship that must hold between the prices of a European call and a European put written on the same underlying currency, and having the same strike price and time to expiration. However, real financial markets are not frictionless, and therefore there is extensive literature on options market efficiency regarding the design of a PCP test with transaction costs.

Furthermore, previous research has relied on the number of PCP violations that lead to arbitrage profits in order to determine options market efficiency. The PCP can be violated even for a fraction of a cent of arbitrage profit per unit of foreign currency options. PCP violations that generate non-attractive arbitrage profits can be considered outliers. The transaction costs can also contribute to filtering of these outliers in order to estimate reasonable arbitrage profits to deduce the efficiency of the options market. Undoubtedly, transaction costs play an important role in establishing options market efficiency based on an arbitrage profit strategy.

The remainder of this paper is organized as follows. Section 2 briefly discusses the relevant literature. Section 3 describes the research methodology and the data. Section 4 provides analysis and interpretations of the empirical findings. Section 5 concludes the paper.

LITERATURE REVIEW

Phillips and Smith (1980) provided a systematic analysis of the transaction costs facing traders in the organized options market. They included explicit costs, in the form of commissions and other fees, and implicit costs such as bid-ask spreads for the pricing of transaction services. The explicit costs of commissions and other fees are institution-dependent. The implicit cost of the bid-ask spread is the difference between the highest quote to buy and the lowest offer to sell the asset in the market. Phillips and Smith (1980) also documented the transaction cost ranges for individual investors, options market makers and arbitrageurs when they initiate trades in either stocks or options. That study indicated that relatively high transaction costs are incurred by individual investors, but refuted the assumption of several previous researchers that market maker transaction costs are negligible. The results indicated that the larger the transaction costs, the wider the band within which prices can swing without creating arbitrage opportunities. Further, Bhattacharya (1983) observed that not all transactions occur at the bid or ask price; a significant percentage occur within the bid/ask spread.

Keim (1989) and Yadav and Pope (1990) estimated an average bid-ask spread of 1 percent in their PCP tests. Subsequently, Puttonen (1993) used an estimate of a 2 percent bid-ask spread for the Helsinki Stock Exchange, which is much more thinly traded than its U.S. and English counterparts, and the FOX index, which consists of the 25 most liquid stocks. Nisbet (1992) identified significant numbers of PCP deviations in the presence of bid-ask spreads which almost entirely disappear when commissions are taken into account with bid-ask spreads as transaction costs. Chateauneuf et al. (1996) observed that bid-ask spreads differ from the traditional formalization of proportional transaction costs. Brunetti and Torricelli (2005) suggested that other types of costs (e.g., clearing fees, short selling costs) should also be considered in addition to bid-ask spreads and commissions in order to compute the transaction costs more precisely.

El-Mekkaoui and Flood (1998) conducted PCP tests on exchange-traded (PHLX) German mark options market efficiency in the presence of transaction costs using intra-daily data. In that study, a foreign exchange transaction fee of 0.0625 percent was taken from Surajaras and Sweeney (1992). Note that Rhee and Chang (1992) used a transaction cost of 0.0409 percent for the spot Deutsche Mark (DEM). Mittnik and Rieken (2000) examined the informational efficiency of the relatively new German DAX-index options market in the presence of transaction costs. In that study, a fee of DM0.40 per contract for market makers trading DAX options at the German options and futures exchange (DTB) and 0.1 percent of the index value (half of the lowest discount-broker fee charged to private investors for trading German stocks) represented the trading costs. Hoque et al. (2008) used spot foreign exchange market spreads as a crude proxy for the transaction costs, because a reliable series of option market bid-ask quotes was not available for that sample.

We summarize the findings of the literature on transaction costs as follows. Transaction costs vary across markets and currencies. There are two major categories of transaction costs: explicit (fixed transaction costs) and implicit (variable transaction costs). Fixed transaction costs (FTC) are institution-dependent and consist of all fees and commissions. Variable transaction costs (VTC) are currency-dependent and crucial to the accuracy of the estimates. In previous studies, options market bid-ask spreads or a percentage of the bid-ask spreads were used as proxies for VTC. In some studies, VTC was obtained from foreign exchange market bid-ask spreads due to the lack of available option market bid-ask spreads for the sample. In general, the literature does not provide a standard method to estimate transaction costs, particularly the VTC.

Hoque et al. (2008) proposed the decomposition of the error term of PCP statistical analysis in order to examine the effects of transaction costs on PCP violation. Following them, we decompose the error term by employing a bootstrapping approach to estimate the transaction costs. This study addressed the controversial issue of transaction costs by implementing a standard method that eliminates the dependence on crude proxies for transaction costs. This paper includes six major currencies of world currency options (WCO) traded in the Philadelphia Stock Exchange (PHLX): Australian dollar (AUD), British pound (BP), Canadian dollar (CAD), Euro (EUR), Japanese yen (JPY) and Swiss franc (SF).

METHODOLOGY AND DATA

We begin this section with descriptions of notations for variables used in this paper. In Table 1, names of the variables are given in column 1, followed by notations in column 2. In the last column, each variable is described in detail.

Table 1: Notations and Descriptions of the Variables

Variables	Notations	Descriptions
Call price	C_t	Call price in domestic currency at time *t*.
Put price	P_t	Put price in domestic currency at time *t*.
Spot price	S_t	Spot price in domestic currency at time *t* for one unit of foreign currency.
Strike price	X_t	Option exercise price in domestic currency at time *t* for one unit of foreign currency.
Domestic interest rate	R_t^d	Domestic currency risk-free interest rate at time *t*.
Foreign interest rate	R_t^f	Foreign currency risk-free interest rate at time *t*.
Option life	T	Expiration time of the option.
Transaction costs	TC_t	Total transaction costs estimated by decomposition of the error term

Giddy (1983) and Grabbe (1983) were among the first to develop relationships for put and call options; these included the PCP theorem for foreign currency, which must be satisfied to prevent dominance or arbitrage possibilities. The PCP relationship is based on the arbitrage principle, as stated in Equation (1),

$$C_{tj} + X_{tj} e^{-R_{tj}^d T} = P_{tj} + S_{tj} e^{-R_{tj}^f} , \tag{1}$$

where $\forall_j = AUD, BP, CAD, EUR, JPY, SF$.

If this relationship is violated, an arbitrage opportunity arises for a conversion or reversal strategy. The conversion strategy involves buying the foreign currency, writing a call, buying an equivalent put, and borrowing the present value of the exercise price. If an arbitrage opportunity does not exist, the present value of conversion strategy should be

$$\left(C_{tj} + X_{tj} e^{-R_{tj}^d T} - P_{tj} - S_{tj} e^{-R_{tj}^f} - TC_{tj} \right) \leq 0 . \tag{2}$$

Conversely, a reversal strategy consists of writing a put, buying a call, shorting the foreign currency, and lending an amount equivalent to the present value of the exercise price. If there is no arbitrage opportunity, the present value of the reversal strategy should be

$$\left(P_{tj} + S_{tj} e^{-R_{tj}^f} - C_{tj} - X_{tj} e^{-R_{tj}^d T} - TC_{tj} \right) \leq 0 . \tag{3}$$

In an efficient options market, these two strategies should not yield any profit. The testable PCP conditions then become

$$\psi_{cj} = \left(C_{tj} + X_{tj} e^{-R_{tj}^d T} - P_{tj} - S_{tj} e^{-R_{tj}^f} - TC_{tj} \right) \tag{4}$$

and

$$\psi_{rj} = \left(P_{tj} + S_{tj} e^{-R_{tj}^{f}} - C_{tj} - X_{tj} e^{-R_{tj}^{d} T} - TC_{tj} \right), \tag{5}$$

where ψ_{cj} and ψ_{rj} are the arbitrage profits under the conversion and reversal strategies, respectively, when the options market is not efficient. Thus, testing all the above PCP conditions is equivalent to testing the hypothesis that the foreign currency options market is efficient when $\psi_{ij} \leq 0$, where i = c (conversion) and r (reversal).

Further rearranging Equation (1), we set $\left(C_{tj} - P_{tj}\right) = Y_{tj}$ and $\left(S_{tj} e^{-R_{ti}^{f}} - X_{tj} e^{-R_{tj}^{d} T}\right) = X_{tj}$ to develop regression equation (6),

$$Y_{tj} = \lambda_0 + \lambda_1 X_{tj} + \varepsilon_{tj}. \tag{6}$$

Following Hoque et al. (2008), who accommodates the potential autocorrelation and conditional heteroskedasticity in order to have unbiased and consistent inferences for λ_0 and λ_1 in Equation (6), note that under the null hypothesis that PCP is valid, the coefficients λ_0 and λ_1 should be 0 and 1, respectively, to conclude that the options market is efficient. Hoque et al. (2008) found that the null hypothesis is rejected for options market efficiency, whereas previous studies had found that the options market is essentially efficient with the transaction costs. We therefore assume that the error term of Equation (6) consists of the effects of transaction costs. The estimated error term can be expressed as in Equation (7),

$$\hat{\varepsilon}_{tj} = Y_{tj} - \hat{\lambda}_0 - \hat{\lambda}_1 X_{tj}. \tag{7}$$

The following two steps are used to estimate FTC and VTC, respectively, by decomposition of the error term.

<u>Step 1</u>: The FTC and the average value of the FTC are estimated in Equations (8) and (9), respectively,

$$FTC_{tj} = \left(Y_{tj} - X_{tj}\right), \tag{8}$$

$$E\left(FTC_j\right) = \frac{1}{n} \sum_{t=1}^{n} FTC_t. \tag{9}$$

<u>Step 2</u>: The VTC is the difference of the error term and the FTC as in Equation (10),

$$VTC_{tj} = \hat{\varepsilon}_{tj} - FTC_{tj}. \tag{10}$$

Substituting the values of the error term and FTC from Equations (7) and (8), respectively, in Equation (10) and rearranging the terms, we obtain Equation (11),

$$VTC_{tj} = \left(1 - \hat{\lambda}_1\right) X_{tj} - \hat{\lambda}_0. \tag{11}$$

Since the error term is not normally distributed, we apply bootstrapping for Equation (12) generate the minimum and maximum VTC from the error term for the VTC condition as stated in Equation (11),

$$\hat{\varepsilon}_{tj} = \left(1 - \hat{\lambda}_1\right) X_{tj} - \hat{\lambda}_0. \tag{12}$$

The bootstrapping is conducted through the "model solution" process of Eviews using the stochastic simulation, 10,000 repetitions and the Newton Solution Algorithm. The average values of the minimum and maximum VTC are estimated in Equations (13) and (14), respectively,

$$E\left(VTC_j^{\min}\right) = \frac{1}{n}\sum_{t=1}^{n} VTC_t \ , \tag{13}$$

$$E\left(VTC_j^{\max}\right) = \frac{1}{n}\sum_{t=1}^{n} VTC_t \ . \tag{14}$$

<u>Data</u>

In this study, PCP tests were conducted for six major currency options (AUD, BP, CAD, EUR, JPY and SF) of the WCO market, traded in PHLX. The WCO market started trading on July 24, 2007 (Offshore A-Letter, 2007), but the data are available from 18 December 2007 in the DATASTREM. This study therefore includes the put-call pairs of the sample currencies from December 18, 2007 to October 7, 2009, which represents total number of 472 daily observations for each currency. The expiration dates of the options are within 90 days on the same cycle as those of stock options, i.e., the third Friday of the month. Each currency options contract represents 10,000 units of the underlying currency, except for Japanese yen (1,000,000). The WCO contract size is smaller than that of the existing currency options contract. Further, the data set consists of the daily closing spot exchange rates and daily risk-free interest rates for all currencies for the sample period which also obtained from DATASTREAM.All of these data are available on request.

EMPIRICAL RESULTS

The PCP econometric analysis was conducted for Equation (6), accommodating serial correlation and ARCH effects using ARMA and GARCH models, respectively. The results are summarized in Table 2. The P-values in parentheses for the F-statistic indicate failure to reject the null hypothesis of no serial correlation and ARCH in the residual for all currencies. Further, the null hypothesis H_0: $\lambda_0 = 0$, cannot be rejected at any reasonable significance level for BP and EUR, but the intercepts (λ_0) are statistically different from 0 in all cases except BP and EUR. However, the estimates of the slopes (λ_1) are all statistically different from zero and less than 1. The overall results suggest that the PCP does not hold for all sample currency options markets.

Table 2: Regression Tests Accommodating Serial Correlation and ARCH Effects

Currency	Intercept (λ_0)	Slope (λ_1)	Serial Correlation		ARCH	
	Coefficient	Coefficient	F-Statistic	ARMA	F-Statistic	GARCH
AUD	-0.0015 (0.0000)	0.2595 (0.0000)	2.0934 (0.1244)	(3,0)	0.0404 (0.8408)	(1,1)
BP	-0.0008 (0.0937)	0.3468 (0.0000)	0.5849 (0.5576)	(1,1)	1.2368 (0.2666)	(1,1)
CAD	0.0006 (0.0017)	0.5364 (0.0000)	1.1733 (0.3103)	(1,0)	0.1741 (0.6767)	(0,0)
EUR	0.0006 (0.1274)	0.5963 (0.000)	0.4823 (0.6177)	(1,1)	0.4137 (0.5204)	(0,0)
JPY	0.1965 (0.0000)	0.8310 (0.0000)	1.5407 (0.2153)	(1,1)	0.1103 (0.7400)	(1,1)
SF	0.0014 (0.0000)	0.5082 (0.0000)	0.2626 (0.7692)	(2,3)	0.2039 (0.6518)	(0,0)

Notes: This table shows the regression estimates of the equation: $Y_{tj} = \lambda_0 + \lambda_1 X_{tj} + \varepsilon_{tj}$ *. Tests of* H_0*:*λ_0*=0 and* λ_1*=1. The P-values are in parentheses below the estimated coefficients and F-statistics. The null hypothesis of the LM test is that there is no serial correlation in the residual up to the lag order p, where the number of lag p = max(r, q) for ARMA (r, q). Similarly, the null hypothesis of the ARCH LM test is that there is no ARCH up to the order given in the residual. The null hypotheses of the LM tests for serial correlation and ARCH are rejected.*

The FTC and VTC represent two major categories of transaction costs (TC) estimated by decomposition of the error term, and are presented in Table 3. The average value of FTC is estimated using Equation (9). Similarly, the average values of Min (minimum) VTC and Max (maximum) VTC are obtained from Equations (13) and (14), respectively. Note that FTC, Min VTC and Max VTC are estimated in terms of U.S. dollars per unit of foreign currency options. The width of the TC swing boundary is the difference between Min VTC and Max VTC from columns 3 and 4, respectively [e.g., for AUD, 0.018429 = 0.010348-(-0.008081)]. The TC swing boundary is the band within which non- attractive arbitrage profits due to PCP violations can swing without creating real arbitrage opportunities. In other words, the profit amount within this band will disappear with appropriate transaction costs.

Table 3: Transaction Costs Estimates by Decomposition of The Error Term

Currency	FTC	Min VTC	Max VTC	TC swing boundary
AUD	0.002124	-0.008081	0.010348	0.018429
BP	0.002423	-0.008657	0.016075	0.024732
CAD	0.001255	-0.004765	0.006802	0.011567
EUR	0.001836	-0.005009	0.007126	0.012135
JPY	0.000019932	-0.00005319	0.00007101	0.012420
SF	0.002356	-0.004123	0.004266	0.008389

Note: The FTC estimates of the equation: $E(FTC_j)=\frac{1}{n}\sum_{t=1}^{n}FTC_t$. *The Min VTC and Max VTC estimate of the equations* $E(VTC_j^{\min})=\frac{1}{n}\sum_{t=1}^{n}VTC_t$ *and* $E(VTC_j^{\max})=\frac{1}{n}\sum_{t=1}^{n}VTC_t$ *, respectively. The FTC, Min VTC and Max VTC are in terms of U.S dollars per unit of foreign currency (FC) options. Since JPY contract size is 1,000,000, the TC swing boundary for JPY is estimated for contract size 10,000 as 0.0012420 [(0.00007101+0.00005319)*100] to permit comparison with other currencies.*

Next, in Table 4, the FTC and VTC are computed in terms of U.S. dollars per contract of foreign currency options using the information reported in Table 3. Column 2 of Table 4 presents the sample foreign currency options contract size. The FTC in column 3 is calculated as the contract size multiplied by the value of FTC as reported in Table 3 [e.g., for AUD, 21.24 = (10,000 x 0.002124)]. Further, the FTC of all the sample currencies except CAD range from 18.36 to 24.23 U.S. dollars. This indicates that the FTC for currencies traded in the PHLX are reasonably close and institution-dependent. The result is consistent with the literature. The Min VTC in column 4 is estimated as the contract size multiplied by the Min VTC (absolute value) as reported in Table 3[e.g., for AUD, 80.81 = (10,000 x 0.008081)]. Similarly, the Max VTC in column 5 is the product of contract size and the value of Max VTC obtained from Table 3. The Min TC in column 6 is the sum of the FTC (column 3) and the Min VTC (column 4). Similarly, the Max TC in column 7 is sum of the FTC (column 3) and the Max VTC (column 5). Both the Min TC and Max TC vary across the currencies. We further observed that the larger the transaction costs (Min TC or Max TC), the wider the TC swing boundary as reported in Table 3. Phillips and Smith (1980) found similar results in their study.

Table 4: Estimates of Transaction Costs (TC)

Currency	Contract size	FTC	Min VTC	Max VTC	Min TC	Max TC
AUD	10,000	21.24	80.81	103.48	102.05	124.72
BP	10,000	24.23	86.57	160.75	110.80	184.98
CAD	10,000	12.55	47.65	68.02	60.20	80.57
EUR	10,000	18.36	50.09	71.26	68.45	89.62
JPY	1,000,000	19.93	53.19	71.01	73.12	90.94
SF	10,000	23.56	41.23	42.66	64.79	66.22

Note: All costs are in terms of U.S. dollars per contract of foreign currency (FC) options.

Finally, we conducted PCP tests without TC ($TC_{tj}= 0$) and with TC ($TC_{tj}\neq 0$) using Equations (4) and (5) for the conversion and reversal strategies, respectively. The PCP violations under different test conditions are presented in Table 5. Without TC, the average PCP violations for all currencies are 75.56 and 24.44 percent under the conversion and reversal strategies, respectively. This means that PCP is always violated, as the sum of the PCP violations is 100 (75.56+24.44) percent for the conversion and reversal strategies. This result is not accurate, however, as it also includes the PCP violations that generated arbitrage profits within the TC swing boundary, as discussed in Table 3. Consequently, the systematic analysis of transaction costs is required to determine the PCP violations by excluding non-attractive arbitrage profits.

Table 5: Put-call Parity (PCP) Violations

Currency	PCP test without TC		PCP test with TC			
	Conversion strategy	Reversal strategy	Conversion strategy		Reversal strategy	
	Violation	Violation	Min violation	Max violation	Min violation	Max violation
AUD	67.58	32.42	2.33	5.08	1.06	1.06
BP	65.89	34.11	0.85	8.26	0.21	0.42
CAD	70.76	29.24	3.39	4.87	0.21	0.64
EUR	69.70	30.30	5.08	8.69	0.42	0.64
JPY	88.56	11.44	2.33	3.18	1.27	1.27
SF	90.89	9.11	3.18	3.60	0.64	0.64
Average	75.56	24.44	2.86	5.61	0.64	0.78

Note: The equations $\psi_{cj} = \left(C_{tj} + X_{tj}e^{-R_{tj}^{d}T} - P_{tj} - S_{tj}e^{-R_{tj}^{f}} - TC_{tj}\right)$ *and* $\psi_{rj} = \left(P_{tj} + S_{tj}e^{-R_{tj}^{f}} - C_{tj} - X_{tj}e^{-R_{tj}^{d}T} - TC_{tj}\right)$ *generate PCP violations in percent under conversion and reversal strategy, respectively. The total number of PCP violation for each currency is the number of observations (472 for each currency) multiplied by the percentage of PCP violations as reported in the table.*

In Table 5, the Min violation and Max violation of PCP are determined using the Max TC and Min TC obtained from Table 4, respectively. Under the conversion strategy, the average Min violation and Max violation for all currency are 2.86 and 5.61 percent, respectively. Similarly, the average Min violation and Max violation are 0.64 and 0.78, respectively, for the reversal strategy. Moreover, for the conversion and reversal strategy together, the total average Min violation and Max violation are 3.50 (2.86+0.64) and 6.39 (5.61+0.78) percent, respectively. This means that the PCP violation varies from 3.50 to 6.39 percent, and indicates that the options market is efficient for 93.61 (100-6.40) to 96.50 (100-3.5) percent of the cases. The overall results suggest that on average, currency options markets are efficient for more than 95 [(93.61+96.50)/2] percent of cases, with appropriate transaction costs.

CONCLUSION

This study addressed the controversial issue of transaction costs for currency options market traders as well as for researchers by implementing a simple and elegant approach to estimate them. We decomposed the error term generated from PCP econometric analysis in order to estimate two major types of transaction costs: FTC (fixed transaction costs) and VTC (variable transaction costs). Since the error term is not normally distributed, we apply the bootstrapping approach for decomposition of the error term. This paper includes six major currencies of world currency options (WCO) traded in the Philadelphia Stock Exchange (PHLX): Australian dollar (AUD), British pound (BP), Canadian dollar (CAD), Euro (EUR), Japanese yen (JPY) and Swiss franc (SF).

For all sample currencies except CAD, the FTC is between 18.36 and 24.23 U.S. dollars, which indicate that the FTC is reasonably close for the sample currencies traded in PHLX. It confirms that the FTC is institution-dependent. The result is consistent with the findings of Phillips and Smith (1980). In the literature, bid-ask spreads are used as a proxy for VTC, which is currency-dependent. In this study, we found similar results, i.e., that the Min VTC and Max VTC vary across currencies. We further observed that the larger the transaction costs (Min TC or Max TC), the wider the TC swing boundary. This is consistent with the findings of Phillips and Smith (1980) in their systematic analysis of transaction costs. Overall, it is evident that the estimated transaction costs in this study are accurate and reliable.

Next, we determined the Min violation and Max violation of PCP with Max TC and Min TC, respectively. We found that the average PCP violations range from 3.50 to 6.39 percent. This means that the efficiency of the options market varies from 93.61 (100-6.40) to 96.50 (100-3.5) percent. The overall results suggest that on average, the currency options market is efficient for more than 95 [(93.61+96.50)/2] percent cases when the appropriate transaction costs are applied. The robustness of transaction cost discovery in this study will eliminate the dependence of transaction costs on crude proxies. Traders and researchers can use this approach as a standard method to estimate transaction costs accurately and reliably. Since the error term is usually designed to capture unknown factors, the estimated transaction costs might include other unknown information. We therefore intend in our future work to design a model that obtains transaction costs precisely after filtering out information other than transaction costs.

REFERENCES

Bhattacharya , M. (1983), Transactions Data Tests of Efficiency of the Chicago Options Exchange. *Journal of Financial Economics*, 12, 161-185.

Brunetti, M.,Torricelli, C., (2005), Put-call parity and cross-markets efficiency in the index options markets: evidence from the Italian market. *International Review of Financial Analysis,* 14, 508-532.

Chateauneuf, A., Kast, R., Lapied, A., (1996), Choquet pricing for financial markets with frictions. *Mathematical Finance,* 6, 323-330.

El-Mekkaoui, M.,Flood, M. D., (1998), Put-call parity revisited: intra daily tests in the foreign currency options market. *Journal of International Financial Markets, Institutions and Money*, 8, 357 376.

Giddy, I. H., (1983), Foreign exchange options. *The Journal of Futures Markets,* 3, 143-166.

Grabbe, J. O., (1983), The pricing of call and put options on foreign exchange. *Journal of International Money and Finance,* 2, 239-253.

Hoque, A., Chan, F.,Manzur M., (2009), Modeling Volatility in Foreign Currency Option Pricing. *Multinational Finance Journal,* 13, 181-200.

Hoque, A., Chan, F.,Manzur M., (2008), Efficiency of the Foreign Currency Options Market. *Global Finance Journal,* 19, 157-170.

Keim, D., (1989), Trading patterns, bid-ask spreads, and estimated security returns: the case of common stocks at the calendar turning points. *Journal of Financial Economics,* 25, 75-97.

Mittnik, S.,Rieken, S., (2000), Put-call parity and the informational efficiency of the German DAX index options market. *International Review of Financial Analysis*, 9, 259-279.

Nisbet, M, (1992), Put-call parity theory and an empirical test of the efficiency of the London traded options market. *Journal of Banking and Finance*, 16, 381-403.

Offshore A-Letter, (2007). A new era in currency trading begins… today. The Sovereign Society (Tuesday, July 24, 2007 Vol. 9, No. 175) http://sovereignsociety.com/2007/07/24/a-new-era-in-currency-trading-begins-today. Accessed 08 February 2010.

Phillips, S. M.,Smith, C. W., (1980), Trading costs for listed options. *Journal of Financial Economics*, 8, 179-201.

Puttonen, V., (1993), Boundary conditions for index options: evidence for the Finnish market. The *Journal of Futures Markets,* 13, 545-562.

Rhee, S. G.,Chang, R., (1992), Intra-day arbitrage operations in foreign exchange and Eurocurrency markets. *Journal of Finance,* 47, 363-379.

Surajaras, P.,Sweeney, R., (1992), Profit-making speculation in Foreign exchange markets (Westview press, Boulder, CO).

Yadav, P. K.,Pope, P. F., (1990), Stock index futures arbitrage: international evidence. *The Journal of Futures Markets,* 10, 573-603.

ACKNOWLEDGEMENTS

The author is grateful to the Editor of this journal and anonymous referees for constructive comments.

BIOGRAPHY

Ariful Hoque (PhD Fin; B Eng; DBA Oracle) is a Lecturer of Finance at University of Southern Queensland. His contact address is School of Accounting, Economics and Finance, University of Southern Queensland, Toowoomba, QLD 4350, Australia. Email: ariful.hoque@usq.edu.au

REVIEWERS

The IBFR would like to thank the following members of the academic community and industry for the much appreciated contribution as reviewers.

Vera Adamchik
University of Houston-Victoria
Yousuf Al-Busaidi
Sultan Qaboos University
Glyn Atwal
Groupe Ecole Supérieure de Commerce de Rennes
Susan C. Baxter
Bethune-Cookman College
Karel Bruna
University of Economics-Prague
Wan-Ju Chen
Diwan College of Management
Leonel Di Camillo
Universidad Austral
Steven Dunn
University of Wisconsin Oshkosh
William Francisco
Austin Peay State University
Lucia Gibilaro
University of Bergamo
Danyelle Guyatt
University of Bath
Zulkifli Hasan
Islamic University College of Malaysia
Tejendra N. Kalia
Worcester State College
Ann Galligan Kelley
Providence College
Halil Kiymaz
Rollins College
Bohumil Král
University of Economics-Prague
Christopher B. Kummer
Webster University-Vienna
Mary Layfield Ledbetter
Nova Southeastern University
Xin (Robert) Luo
Virginia State University
Andy Lynch
Southern New Hampshire University
Cheryl G. Max
IBM
Avi Messica
Holon Institute of Technology
Cameron Montgomery
Delta State University
Bilge Kagan Ozdemir
Anadolu University
Dawn H. Pearcy
Eastern Michigan University
Rahim Quazi
Prairie View A&M University
Anitha Ramachander
New Horizon College of Engineering
Kathleen Reddick
College of St. Elizabeth
Matthew T. Royle
Valdosta State University
Tatsiana N. Rybak
Belarusian State Economic University
Rafiu Oyesola Salawu
Obafemi Awolowo University
Paul Allen Salisbury
York College, City University of New York
Sunando Sengupta
Bowie State University
Smita Mayuresh Sovani
Pune University
Jiří Strouhal
University of Economics-Prague
Ramona Toma
Lucian Blaga University of Sibiu-Romania
Jorge Torres-Zorrilla
Pontificia Universidad Católica del Perú
K.W. VanVuren
The University of Tennessee – Martin
Veronda Willis
The University of Texas at San Antonio
Eduardo Sandoval
Universidad de Concepción
M. Shahadat Hossain
SUNY Potsdam

ARBITROS

El IBFR agradece a los siguientes miembros de nuestro cuerpo de *Ad-Hoc Reviewers* por su contribución académica.

María Antonieta Andrade Vallejo
Instituto Politécnico Nacional
Olga Lucía Anzola Morales
Universidad Externado de Colombia
Antonio Arbelo Alvarez
Universidad de la Laguna
Hector Luis Avila Baray
Instituto Tecnologico De Cd. Cuauhtemoc
Graciela Ayala Jiménez
Universidad Autónoma de Querétaro
Sheila Nora Carrillo Incháustegui
Univ. Peruana Cayetano Heredia
María Antonia Cervilla de Olivieri
Universidad Simón Bolívar
Semei Leopoldo Coronado Ramírez
Universidad de Guadalajara
Tomás J. Cuevas-Contreras
Universidad Autónoma de Ciudad Juárez
Javier de León Ledesma
Univ. de Las Palmas de Gran Canaria -Tafira
Carlos Fong Reynoso
Universidad de Guadalajara
Arturo Hernández
Universidad Tecnológica Centroamericana
Lourdes Jordán Sales
Universidad de Las Palmas de Gran Canaria
Santiago León Ch.,
Universidad Marítima del Caribe
Graciela López Méndez
Universidad de Guadalajara-Jalisco
Virginia Guadalupe López Torres
Univ. Autónoma de Baja California
Angel Machorro Rodríguez
Instituto Tecnológico de Orizaba
Omaira Cecilia Martínez Moreno
Univ. Autónoma de Baja California
Alaitz Mendizabal Zubeldia
Univ. del País Vasco/ Euskal Herriko U.
Juan Nicolás Montoya Monsalve
Univ Nacional de Colombia-Manizales
Alberto Elías Muñoz Santiago
Fundación Universidad del Norte
Juan Carlos Robledo Fernández
Universidad EAFIT-Medellin
Universidad Tecnologica de Bolivar
José Gabriel Ruiz Andrade
Univ. Autónoma de Baja California
Juan Manuel San Martín Reyna
Univ. Autónoma de Tamaulipas
Francisco Sanches Tomé
Instituto Politécnico da Guarda
Deycy Janeth Sánchez Preciado
Universidad del Cauca
María Cristina Sánchez Romero
Instituto Tecnológico de Orizaba
Pol Santandreu i Gràcia,
Universitat de Barcelona
Santandreu Consultors
Victor Gustavo Sarasqueta
Universidad Argentina de la Empresa UADE
Jaime Andrés Sarmiento Espinel
Universidad Militar de Nueva Granada
Lorena Vélez García
Universidad Autónoma de Baja California
Alejandro Villafañez Zamudio
Instituto Tecnologico de Matamoros
Hector Rosendo Villanueva Zamora
Universidad Mesoamericana
Alfonso Rodríguez Ramírez
Universidad Libre Seccional Cali
Neyda Cardozo Sánchez
Universidad Nacional Experimental de Táchira
Benjamin Castillo Osorio
Universidad del Sinú-Sede Monteria
Luz Stella Pemberthy Gallo
Universidad del Cauca
Adolfo León Plazas Tenorio
Universidad del Cauca
Luis Eduardo Sandoval Garrido
Universidad Militar de Nueva Granada
Oskar Villarreal Larrinaga
Univ. del País Vasco/Euskal Herriko Univ.
Adriana del Carmen Rodríguez Guardado
Universidad de Guadalajara

HOW TO PUBLISH

Submission Instructions

The Journal welcomes submissions for publication consideration. Authors wishing to submit papers for publication consideration should e-mail their manuscripts to editor@theIBFR.com. Complete directions for manuscript submission are available at the Journal website www.theIBFR.com. Papers may be submitted for initial review in any format. However, authors should take special care to address spelling and grammar issues prior to submission. Authors of accepted papers are required to precisely format their document according to the guidelines of the journal.

There is no charge for paper reviews. The normal review time for submissions is 90-120 days. However, authors desiring a quicker review may elect to pay an expedited review fee. Authors who pay the expedited review fee are guaranteed an initial review within two weeks of submission and receipt of the fee. Authors of accepted papers are required to pay a publication fee based on the length of the manuscript. Please see our website for current publication and expedited review rates.

Authors submitting a manuscript for publication consideration must guarantee that the document contains the original work of the authors, has not been published elsewhere, and is not under publication consideration elsewhere. In addition, submission of a manuscript implies that the author is prepared to pay the publication fee should the manuscript be accepted.

Subscriptions

Individual and library subscriptions to the Journal are available. Please contact us by mail or by email to: admin@theibfr.com for updated information.

Contact Information

Mercedes Jalbert, Managing Editor
The IBFR
P.O. Box 4908
Hilo, HI 96720
editor@theIBFR.com

Website

www.theIBFR.org or www.theIBFR.com

PUBLICATION OPPORTUNITIES

Review of Business & Finance Case Studies

Review of Business and Finance Case Studies publishes high-quality case studies in all areas of business, finance and related fields. Cases based on real world and hypothetical situations are welcome.

All papers submitted to the Journal are double-blind reviewed. The RBFCS is listed Cabell, Ulrich's Periodicals Directory. The Journal is distributed through SSRN and EBSCO*Host* publishing, with presence in over 70 countries.

The journal accept rate is between 15 and 25 percent

Business Education and Acreditation (BEA)

Business Education & Accreditation publishes high-quality articles in all areas of business education, curriculum, educational methods, educational administration, advances in educational technology and accreditation. Theoretical, empirical and applied manuscripts are welcome for publication consideration.

All papers submitted to the Journal are double-blind reviewed. BEA is is listed Cabell, Ulrich's Periodicals Directory. The Journal is distributed through SSRN and EBSCO*Host* publishing, with presence in over 70 countries.

The journal acceptance rate is between 15 and 25 percent.

Accounting and Taxation (AT)

Accounting and Taxation (AT) publishes high-quality articles in all areas of accounting, auditing, taxation and related areas. Theoretical, empirical and applied manuscripts are welcome for publication consideration.

All papers submitted to the Journal are double-blind reviewed. BEA is listed Cabell, Ulrich's Periodicals Directory. The Journal is distributed through SSRN and EBSCO*Host* publishing, with presence in over 70 countries.

The journal acceptance rate is between 5 and 15 percent.