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DO INVESTORS USE CUSTOMER METRICS TO VALUE HIGH GROWTH SERVICE FIRMS?

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ABSTRACT

High growth service firms invest resources to acquire and retain customers, creating intangible assets. This paper tests whether investors use customer metrics to value these firms. Using a unique hand-collected data set, we show that investors discount the values of high growth service firms if their service costs per customer are high, perhaps because high service costs are associated with inefficient business operations. Conversely, investors boost the values of high growth service firms with high acquisition costs per customer, perhaps because higher acquisition costs are associated with customers who generate larger future cash flows. We also show that relatively high growth firms tend to disclose customer metrics more frequently, monthly rather than quarterly, helping to moderate the inherent uncertainty in their quarterly earnings. We find that customer metrics are incrementally informative to traditional financial performance measures, particularly when valuing high-growth service firms.

JEL: G12, G14, M41

KEYWORDS: Customers, Valuation, Intangibles

INTRODUCTION

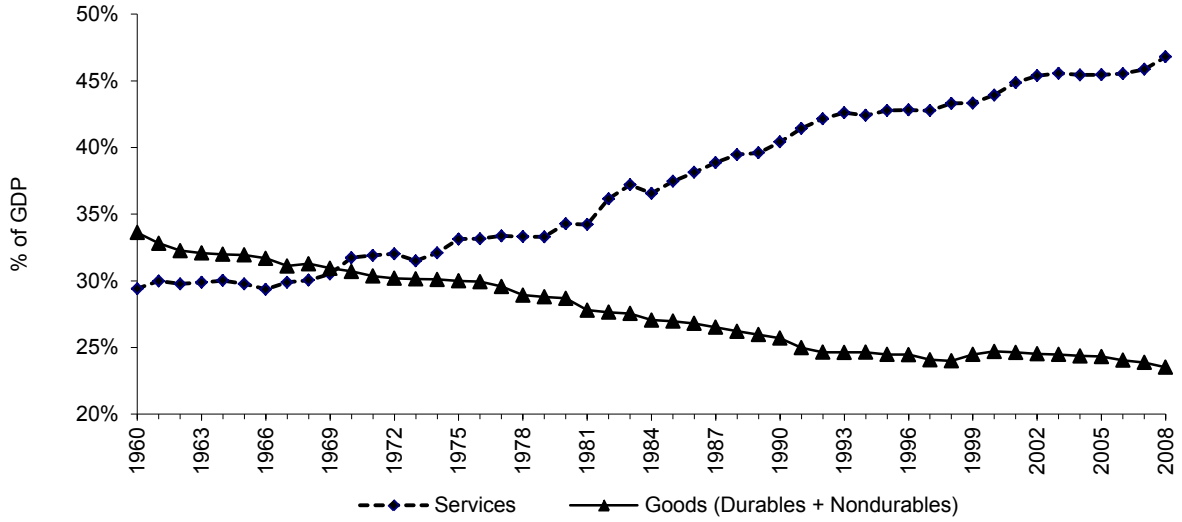
Investors struggle to correctly value many high-growth service firms because they often have negative cash-flows, no dividends or earnings, and little asset book value. Traditional valuation models that rely on these measures produce inaccurate or nonsensical prices. Damodaran (2001) suggests that one way around the problem is to forecast the traditional value measures and then discount. We argue that investors may instead value the firms by valuing their customers as intangible assets.

Non-traditional information disclosures are becoming more common, perhaps because the ratio of firms' intangible assets to physical assets has increased during the last 25 years. New technology-based service industries, like those built around the internet, are a larger part of our economy, and firms in those industries have proportionately more intangible assets.Indeed, the service sector of the U.S. economy has grown to far exceed the good producing sector. Figure 1 illustrates how personal consumption of services as a proportion of GDP started to grow around 1970, and accelerated in the 1980s and 1990s. Conversely, the relative consumption of physical goods (durables plus non-durables) has declined, particularly in the 1980s and 1990s.In line with this trend, the service sector's higher proportion of U.S. corporate investments has led to an increase in intangible assets. Figure 2 shows the impact on price to book ratios of U.S. companies at the 95th percentile of price-to-book during the same time period. Data for the S&P 500 are not available for the full period, but the index's price to book ratio also increased from 1.2 in 1978, to 3.1 in 2006, with a high of 4.9 in 2000. Hence, the dramatic increase in intangible assets is apparent even for large S&P 500 firms.

Note that the steady upward trend in market to book values starts in the late 1970s and early 1980s. This is about the same time that the U.S. service sector growth accelerated (see Figure 1). Although research on intangible asset values has grown, much of it focuses on R&D. But growth in corporate R&D probably does not explain the trend in intangible assets during the last 25 years because R&D spending as a proportion of sales was flat at about three percent from 1985 to 1999, while market to book values were

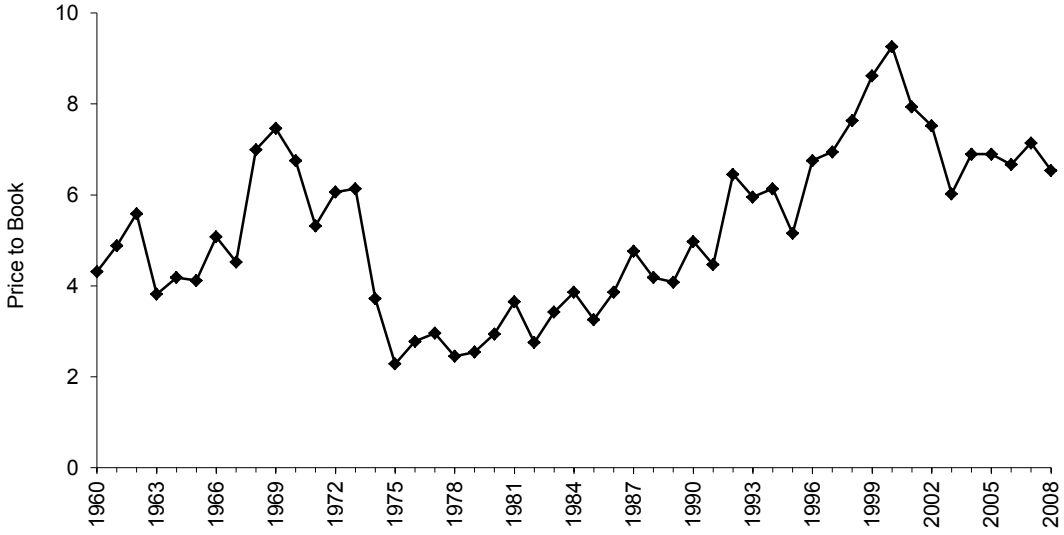
strongly rising (http://www.nsf.gov/statistics/iris/search_hist.cfm?indx=13). The rise in market to book values could be explained by the growth in other intangible assets.

Figure 1: Personal Consumption of Services and Goods (Durable plus Nondurable) as a Proportion of U.S. Gross Domestic Product



Source: Bureau of Economic Analysis

Figure 2: The Ratio of Market Price to Book Value of Equity for U.S. Stocks at the 95th Percentile of Price to Book Value



Source: Kenneth French's website

We compile a unique data set collected from press releases and Securities and Exchange Commission (SEC) filings to study whether investors use customer metrics (new customers, customer service costs and customer acquisition costs) to value high-growth service firms. Wall Street analysts often track customer metrics to gauge the success and efficiency of a firm's competitive strategy. One indicator of the value of these disclosures is that the SEC has started to monitor them and penalize firms that misreport them. A growing number of firms report these numbers in their SEC filings. The SEC and the Department of Justice (DOJ) investigated AOL Time Warner's advertising arrangements and their methods used to

compute subscriber numbers reported in 2002 10Qs and press releases. In late 2004, Time Warner settled charges arising from these initial investigations, and other accounting and securities fraud charges, for over $500 million. In June 2004, the SEC investigated how telecommunications and cable companies count their customers (Young and Grant 2004). Our customer metric results add to the relatively thin literature on non-traditional valuation.

We also study the inherent tension between customer service and customer acquisition spending. All else equal, investors prefer low costs, but sometimes higher current spending can be a good long-term investment because such spending creates intangible customer assets. For example, if service firms with relatively high growth opportunities spend more on customer acquisition, they may capture valuable customers before their competitors. In a low-growth market, this could be a poor strategy, particularly if a firm skimps on service expenditure to fund customer acquisition. In their recent literature review of the impact of marketing on firm value, Srinivasan and Hanssens (2009) note that executives are increasingly being held accountable for the financial impact of their marketing actions. They suggest that further research is needed to better understand the financial response to various marketing information and the valuation impact of different marketing intangibles.

The remainder of the paper is organized as follows. Section 2 contains a review of the relevant literature. In Section 3 we describe hypothesis development and the empirical models. Data collection and the sample are discussed in Section 4. In Section 5 we analyze the empirical results. Section 6 concludes the paper.

LITERATURE REVIEW

Researchers report significant relations between firm value and non-traditional disclosures. Demers and Lev (2001) and Trueman, Wong, and Zhang (2000) find that website traffic is positively related to the values of internet firms. Amir and Lev (1996) find that wireless communication firms' POPS (population size) and customer penetration (subscribers divided by POPS) better explain their stock prices than earnings, book values, and cash-flows. Indeed, Lev (2004) suggests that to improve investors' understanding of firm performance, managers need to supplement the accounting and financial information already available, with more detailed disclosure of their intangible assets.

Research on intangible asset valuation is limited by data availability. One exception is research and development (R&D) because firms must disclose R&D spending. Researchers have found a strong positive relation between intangible R&D assets and stock value, including Chan, Lakonishok, and Sougiannis (2001) and Eberhart, Maxwell, and Siddique (2004). Hall, Jaffe, and Trajtenberg (2005) and Hirschey, Richardson, and Scholz (2001) show that innovation output measures like patent counts and patent citations, are significantly related to firm market value. And a number of studies find that Food and Drug Administration (FDA) decisions affect firm value because they affect firms' intangible R&D assets. Ahmed, Gardella, and Nanda (2002) find that drug withdrawals, particularly FDA candidates in advanced stage clinical trials, lead to significant wealth losses for firms. Bosch and Lee (1994) find that FDA approval of a drug candidate translates to a significant positive abnormal return (+1.75%) for the firm, while FDA rejection causes a significant negative stock price reaction (-6.59%). Alefantis, Kulkarni, and Vora (2004) demonstrate that the announcement of FDA "fast track designation" for a drug candidate leads to a significant rise in stock price.

Our customer-based measures could be more closely related to firm market value than R&D output measures for several reasons. First, new customers are more homogenous than most R&D output measures; e.g., the value of patents varies widely. Second, customers are typically added in bunches, hence, variation in the value of any particular new customer has less impact on the average value of new

customers. Finally, the time series relation between current and future new customers could be more stable than the relation between current and future patents.

Marketing researchers have for some time used customer metrics such as customer lifetime value (CLV), which is the value that a customer is expected to generate during the time he buys from the firm. For example, Day and Fahey (1988) note that the large variations in stock price-to-earnings and price-to-book ratios is caused by investors valuing stocks based upon something other than current earnings. Srivastava, Shervani, and Fahey (1999) argue that intangible marketing assets, like customers and brands, are traded like other assets and used to lower costs or raise entry barriers. Graham and Frankenberger (2000) show that changes in real advertising expenditures impact future earnings and market values. Rust, Lemon, and Zeithaml (2004) model the value of a marketing strategy as a function of CLV. Gupta, Lehmann, and Stuart (2004) demonstrate how valuing customers makes it feasible to value high-growth firms with negative earnings. Second, we provide evidence that investors use customer metrics to value firms, and the value effects differ depending upon disclosure frequency (monthly versus quarterly). Third, we examine whether differences in growth opportunities affect the relation between customer metrics and firm value. Szewczyk, Tsetsekos, and Zantout (1996) and Chen and Ho (1997) find that the market more favorably perceives capital expenditures by firms with high growth opportunities.

Our customer metrics data set is comparatively large. It includes 31 firms in 16 service industries covering 605 firm-quarter observations. Earlier studies of consumer metrics use considerably less data. For example, Gupta, Lehmann, and Stuart (2004) use five companies and rely on manager estimates as opposed to objective data. Amir and Lev (1996) study 14 firms from the cellular telephone industry. But the usable data available for our study is also limited by several factors. First, high growth is typically associated with new industries or breakthrough products (e.g. the internet). Except for a few winners, most firms do not sustain their growth for long. Second, the mortality rate for these firms is often high, so that many do not have enough data to be included in our study. Third, some firms have too little publicly available data because they were privately owned for a considerable period of time. Finally, some firms do not maintain a consistent method of computing their metrics, making only part of it useful.

Besides our unique data, our study contributes to the literature in other ways. First, we study whether customer metrics help explain firm value beyond traditional financial metrics. We use finance, accounting, and marketing literatures to guide our empirical models. Our results show more significant value effects for high growth firms, and that high growth firms benefit most from more frequent disclosure. Finally, we estimate the value effects (abnormal returns) of customer metrics using the actual event dates when firms announce their figures in press releases or SEC filings. Earlier studies of the effects of R&D figures, for example, use estimated event dates. Chan, Lakonishok, and Sougiannis (2001) assume that firms' annual R&D figures are announced to the market in April of each year, and Eberhart, Maxwell, and Siddique (2004) use a three month lag from firms' fiscal year ends as their event dates.

HYPOTHESIS DEVELOPMENT AND EMPIRICAL MODELS

Firms often report customer metrics quarterly, so it can be difficult to disentangle their effects on stock price from quarterly earnings announcements. To separate the effects, we use the value relevance and the earnings response coefficient (ERC) models. The models can provide complementary evidence because value relevance examines stock prices and ERC examines stock returns. Both can be adapted to examine whether specific information disclosures affect firm value, independent from the effects of earnings disclosures. For example, Kallapur and Kwan (2004) use the value relevance model to test the effects of information on brand assets, and Rajgopal, Venkatachalam, and Kotha (2003) use it to test for the effects of information on the value of virtual communities.

The ERC method could provide a better test of the significance of our customer variables because it models marginal changes (stock returns) as opposed to levels (stock price). We suspect that analysts who use customer metrics are more interested in how the data reflect firms' strategy changes. Nevertheless, Kothari and Zimmerman (1995) argue that neither methodology clearly dominates the other. Consequently, in line with Bodnar and Weintrop (1997) and Bodnar, Hwang, and Weintrop (2003), we test for the significance of customer metrics using both methods.

Value Relevance Model

We implement the value relevance model with the following regression of market value on book value, earnings, and other variables (X). In our case, X includes customer metrics.

$$\text{MARKET VALUE} = \alpha + \beta_1 * \text{BOOK VALUE} + \beta_2 * \text{EARNINGS} + \beta_3 * X + \varepsilon$$

A statistically significant coefficient on a variable in X indicates that it is associated with market value, after controlling for book value and earnings.

Hypothesis Development for the Value Relevance Method

Firms often spend large sums on advertising and marketing, primarily to acquire customers. Firms also invest in other operational activities to service existing customers. Our customer metrics include measures of customer acquisition and service costs. Advertising and marketing expense per new customer is our measure of customer acquisition cost. Service expense per customer is our measure of service cost. We hypothesize that:

H1: *Per-customer acquisition costs and per-customer service costs are significantly related to market value.*

Lower values of these metrics could indicate greater operational efficiency, and may have a positive impact on firm value. On the other hand, higher values of these metrics could indicate that a firm is building long-term investments in customer assets, spending heavily now to capture loyal customers for the long term. We hypothesize that the direction of the relation between customer metrics and market value depends on growth opportunities available to the firm.

H2a*: Per-customer acquisition costs and per-customer service costs are significantly negatively related to market value for relatively low-growth firms.*

H2b*: For relatively high-growth firms, the sign of the relations between market value and per-customer acquisition costs and per-customer service costs depends upon whether negative cost effects dominate positive long-term investment effects.*

Why could the relations differ depending upon a firm's growth rate? High-growth firms are building their businesses, which typically require more up-front investment. For service firms, this investment is in customer acquisition. Investors may value heavy spending on rapid customer acquisition because it can allow the firms to attain economies of scale or first-mover advantages. Conversely, investors may not value customer acquisition as highly for low-growth firms with more steady-state businesses. Scale or first-mover benefits may be small compared to the benefits of cost efficiency and quality of service to current customers.

Empirical Model for the Value Relevance Method

The regression model to test for the value-relevance of our customer measures is:

$$MV_{jt} = \beta_0 + \beta_1 BV_{jt} + \beta_2 E_{jt} + \beta_3 SPC_{jt} + \beta_4 APC_{jt} + \beta_5 (GROWTH_{jt} * SPC_{jt}) + \beta_6 (GROWTH_{jt} * APC_{jt}) + e_{jt} \quad (1)$$

where,

MV_j = market value per share of equity,
BV_{jt} = book value per share of equity at the end of the financial period preceding the announcement window,
E_{jt} = = earnings per share in the financial period preceding the announcement window,
SPC_{jt} = service expenditure per existing customer,
APC_{jt} = acquisition expense per new customer,
$GROWTH_{jt}$ = measure of growth opportunities.

The dependent variable, MV, is the market value of equity one day after the announcement date. Book value of equity BV, measures the accounting value of assets less liabilities at the end of the fiscal period. In line with Rajgopal, Venkatachalam, and Kotha (2003) and Kallapur and Kwan (2004), we include earnings before extra-ordinary earnings, E, as an independent variable. The financial variables are calculated on a per-share basis following the approach adopted by Collins, Maydew, and Weiss (1997) and Francis and Schipper (1999).We test for the value relevance of customer metrics using two measures - service expenditure per existing customer, SPC, and acquisition expense per new customer, APC. These variables reflect the firm's operational efficiency in acquiring and retaining customers.

The direction of the relation between market value and our variables of interest, SPC and APC, could be influenced by growth opportunities. Consequently, our regressions include a GROWTH variable interacted with SPC and APC. Market-to-book ratio, a common measure of growth opportunities is a direct function of the dependent variable; therefore, we follow Goyal, Lehn, and Racic (2002) and use alternate proxies for growth opportunities. They test five commonly used proxies of growth opportunities - the ratio of market to book value of assets, the ratio of market to book value of equity, earnings-to-price ratio, the ratio of capital expenditure to book assets, and the ratio of R&D to book assets. Since the first three proxies are functions of the dependent variable, we test only the last two proxies, adapted for our study as appropriate. One proxy is the change in ratio of capital expenditure to book value of assets, and the other is the change in the ratio of R&D expenditure to book value of assets. From Hypothesis 2, the coefficient estimates (β_5 and β_6) on the GROWTH interaction variables could be positive, if investment effects dominate cost effects.Because we use panel data, our panel regressions include intercept dummies for each firm and each time period to capture firm-specific and time-specific effects.

Earnings Response Coefficient Model

Earnings response coefficients (ERCs) measure the sensitivity of stock returns to earnings surprises. We regress abnormal stock returns (ABRETURN) on unexpected earnings changes (UE), and other information variables of interest (X) as follows;

$$ABRETURN = \alpha + \beta_1 * UE + \beta_2 * (X * UE) + \varepsilon ,$$

where α and β_1 are coefficients, β_2 is a vector of coefficients, and ε is an error term.

A traditional base ERC model would exclude X and simply estimate stock return response to unexpected earnings as ERC = β_1. The common finding is $\beta_1 > 0$, that is, higher-than-expected earnings generate

positive abnormal returns. The larger the β_1, the more sensitive a firm's stock return to its earnings surprises.

We add the customer metric variables in X to the model and estimate their coefficients in β_2. For this discussion, assume that X contains one variable. If $\beta_2 > 0$ ($\beta_2 < 0$) and is statistically significant, then the variable makes a firm's return more (less) sensitive to unexpected earnings Of course, if $\beta_2 = 0$, then the information disclosure has no impact. The interpretation of the sign of β_2 is a bit counter-intuitive. $\beta_2 > 0$ essentially means that a firm's ERC is larger because of the information disclosure. The particular disclosure makes earnings a better signal of the firm's financial prospects. The average level of unexpected earnings could be smaller, but investors react proportionately more to a given level of the firm's unexpected earnings. Conversely, if $\beta_2 < 0$, then the disclosure makes earnings a poorer signal of a firm's financial prospects, and investors react proportionately less. For example, investors should react less to unexpected earnings announced by a firm with poor financial information systems because the earnings will contain more noise.

Hypothesis Development for the ERC Method

Firms invest in customer acquisition and customer service. Reichheld (1996) and Thomas (2001) find that the costs to acquire a customer are significantly greater than the cost of servicing them. But shifting funds from customer service to customer acquisition can produce dissatisfied customers who reduce purchases. Bolton (1998) and Richins (1983) suggest that dissatisfied customers also relate their unfavorable experiences to others, amplifying the direct negative effects that dissatisfied customers have on sales and firm value. Reichheld (1996) and Hughes (2006) find that customer retention critically affects the value of a customer to a firm, and hence, firm value.

Our sample includes firms from different industries and at different growth stages. Therefore, the absolute size of service and acquisition spending may be less informative to investors than their relative sizes. Reichheld (1996) and Thomas (2001) show that the relation between customer retention and customer acquisition is economically significant. Consequently, we use the ratio of service to acquisition spending to measure a firm's spending strategy. Our first ERC hypothesis is:

H3: *Firms with larger ratios of service spending to acquisition spending have larger ERCs.*

The intuition behind this hypothesis is that spending relatively more on customer service is likely to produce a stable customer base and easy-to-predict earnings. But when a firm reports an earnings surprise, investors are likely to see it as a relatively strong signal that something significant has changed. Therefore, stock returns will be more sensitive to earnings surprises.

Some of our firms report customer metrics monthly, although the majority reports them quarterly. Monthly updates should enable investors to better estimate quarterly earnings before they are announced. Therefore, monthly disclosures should also lead to larger market reactions to earnings surprises and larger ERCs. With similar reasoning, others suggest that higher quality earnings increase ERCs. For example, Balsam, Krishnan, and Yang (2003) and Teoh and Wong (1993) find higher ERCs for clients of industry specialist auditors and large (Big 6) auditors, respectively. Therefore, we hypothesize that:

H4: *Firms that report monthly customer metrics have larger ERCs.*

Amir and Lev (1996) find significant differences in value effects between telephone companies (low growth firms) and cellular companies (high growth firms). Therefore, the relation between firm value and customer metrics could differ when there is a significant difference in growth opportunities. We hypothesize that:

H5*: The relations proposed in H3 and H4 could differ between firms with high growth opportunities and firms with low growth opportunities.*

The intuition behind this hypothesis is that investors could interpret the information conveyed by customer metrics differently depending upon a firm's growth opportunities. We have assumed that a specific value of a customer metric means the same thing across firms but this may not hold perfectly. For example, high growth may be associated with inherently uncertain earnings, and some firms may release monthly figures to help moderate the uncertainty. Therefore, our disclosure frequency indicator variable could pick up this uncertainty effect, so that the effect predicted in H4 may only appear for high-growth firms. Indeed, among our sample of firms, those that disclose monthly have significantly greater growth opportunities than those that disclose quarterly (average market to book value ratio of 6.29 compared to 3.25 for quarterly disclosers)**.**

Empirical Model for the ERC Method

We isolate the impact of the public disclosure of customer metrics on stock returns from the impact of earnings surprises using the following regression model:

$$CAR_{jt} = \alpha_0 + \alpha_1 UE_{jt} + \alpha_2(STA_{jt}*UE_{jt}) + \alpha_3(FREQ_{jt}*UE_{jt}) + \alpha_4(GROWTH_{jt}*STA_{jt}*UE_{jt}) + \alpha_5(GROWTH_{jt}*FREQ_{jt}*UE_{jt}) + \alpha_6(MTB_{jt}*UE_{jt}) + \alpha_7(SIZE_{jt}*UE_{jt}) + e_{jt} \quad (2)$$

where, for firm j in time t,

CAR_{jt} = earnings announcement cumulative abnormal returns,

UE_{jt} = unexpected earnings (earnings surprise),

STA_{jt} = ratio of service expenditure per customer to acquisition expense per new customer,

$FREQ_{jt}$ = indicator variable for frequency of disclosure,

$GROWTH_{jt}$ = indicator variable for growth opportunities,

MTB_{jt} = control variable for growth opportunities,

$SIZE_{jt}$ = control variable for firm size.

The dependent variable CAR_{jt}, is the market model abnormal return in the event window around the firm's earnings announcement. For this short window, the start date is two days before the event and the end date is one day after the event (event window is [-2,1] with day 0 the announcement date). The market model parameters are estimated for the 255-day period ending at the start of the event window. We considered other methods to measure abnormal returns. Additional risk factors such as firm size, value or momentum (incorporated in the Carhart four-factor model) should have little effect on our short-term event study. Some studies calculate an alternate measure of abnormal returns using a matched pair sample. This approach to risk-equalized returns is not possible in our study, since non-disclosing firms would necessarily have to be from another industry with possibly very different risk characteristics (since firms that disclose customer metrics appear to follow industry norms where all firms in that industry disclose).Unexpected earnings UE, is measured as realized earnings per share minus consensus analyst forecasted earnings per share. Some studies have assumed a random walk earnings model, and hence reported earnings change to proxy for unexpected earnings. Others have used ARIMA models for data sets with long time series.

Hypothesis 3 implies that $\alpha_2 > 0$, that is, relatively more service expenditure increases ERCs. To test Hypothesis 3, we define STA as the ratio of service expenditure per customer to acquisition expense per new customer. This definition of STA is in line with papers in the literature that formulate the variable of interest as a ratio or as an indicator variable. This specification partly accounts for firm and time effects in regressions of cross-sectional times-series data. For example, Hughes (2000) tests the value relevance of nonfinancial measures of air pollution using a ratio EMIT (average percentage of SO_2 emitted per year relative to total emissions) and an indicator variable CLIM (annual average of the quarterly *Value Line* assessments of the regulatory environment). Park and Pincus (2001) test the response of equity markets to the mix of equity sources using the ratio of internal equity to external equity.

Hypothesis 4 implies that $\alpha_3 > 0$, that is, monthly disclosure increases ERCs. FREQ is an indicator variable equal to 1 if the firm releases figures monthly, and 0 if it releases them quarterly. We use the market-to-book ratio as a proxy for growth opportunities available to a firm. GROWTH is an indicator variable that takes the value 1 if market-to-book ratio is high (greater than 4), and 0 otherwise (as per Brigham and Ehrhardt (2005) p. 456: "The average company in the S&P 500 had a market/book ratio of about 4.23 in the summer of 2003"). The average for our sample is 4.09. The regression also includes GROWTH interacted with the focus variables STA and FREQ, and then UE, to measure the effect of growth on the relations between ERCs and STA and FREQ. Hypothesis 5 implies that α_4 and α_5 are statistically significant.The ERC relation could be affected by exogenous factors. Easton and Zmijewski (1989) and Collins and Kothari (1989) predict that ERC is negatively related to systematic risk, measured by the beta estimate obtained from the market model. We control for systematic risk by calculating a market-model adjusted CAR. Collins and Kothari (1989) find a positive relation between growth opportunities and ERC. MTB, the ratio of market value of equity to the book value of equity, is included as our proxy for growth opportunities. SIZE, measured by the logarithm of total assets, is included as an additional control. As with our earlier tests, all regressions include intercept dummies for each firm and each time period to capture firm-specific and time-specific fixed effects.

Data Collection and Sample

Customer Metrics: Data are collected for the period of January 1994 to December 2005. Firms are not required to disclose customer metrics, and they are not available in any public database. The data are scarce before 1994; however, investors have increasingly pressured fast-growing service firms to provide it. Many Wall Street firms, such as Salomon Smith Barney and Merrill Lynch, actively track this data and use it in analyst reports to their customers. In fact, Gupta, Lehmann and Stuart (2004) acknowledge receipt of detailed account information from Salomon Smith Barney.

Most customer metrics have to be manually collected, primarily from 10-K, 10-Q filings, and press releases. If a particular press release is not available on the corporate web-site, we attempt to obtain the missing data from other news resources such as Lexis-Nexis, PR Newswire, or through internet search engines Google and Yahoo. Some firms report the number of new customers acquired during a quarter. The variable for customers serviced (SC) is calculated as the difference between total customers at the end of the period and the number of new customers (NC). Our primary measure of NC is the figure reported by the firm; however, not every firm in our sample reports the number of new customers. Consequently, we use the quarterly net change in total customers as an alternate measure of NC.

We faced some challenges in the data collection process because there is no public database that provides these customer metrics or even the names of companies that disclose this information. Furthermore, some provide the data only sporadically; e.g., only if they experienced a significant increase in customer base. Some firms, such as Amazon, provide customer-level data but not in the format required in our model. Many firms, particularly those in the telecommunication industry such as AT&T and Verizon, sometimes

change their computation methods. Because we require consistency of the reported data, firms that do not follow a particular reporting method for an extended period of time are omitted from our sample.

The final sample consists of 31 firms that report the number of customers between fiscal year-ending periods between January 1995 and December 2005. Some firms do not report the number of customers, but they report other metrics that are close proxies. Table 1 lists the specific metric reported by each firm in the final sample. Based on NAICS 2007 industry codes obtained from the COMPUSTAT database, the firms come from 16 service industries including software, broadcasting, telecommunications, internet, brokerage, insurance, rental, programming, consulting, educational, and medical services.

Table 1: Sample Description

Firm name	Industry*	Metric for number of customers	Time Period	Disclosure frequency	Size ($M)	M/B	P/E
AMERIGROUP	524114	Membership	2000-2005	Quarterly	759.7	2.61	15.46
Ameritrade	523120	Open client accounts	1998-2005	Monthly	8291.1	6.24	103.47
Career Education	611210	Student population	1999-2005	Quarterly	770.6	4.56	29.14
Centene	524114	Medicaid membership	2002-2005	Quarterly	373.6	3.43	17.44
Charles Schwab	523120	Active client accounts	1995-2005	Monthly	29933.4	7.18	54.74
Coventry Health Care	621491	Health plan membership	2000-2005	Quarterly	2138.3	2.98	15.96
DeVry	611310	All enrollments	1994-2005	Monthly	487.0	7.61	36.07
DIRECTV	515210	U.S. subscribers	2004-2005	Quarterly	15488.7	2.75	61.39
E*Trade	523110	Active accounts	1998-2005	Monthly	20367.6	2.79	49.62
eBay	517919	Confirmed registered users	1998-2005	Quarterly	3856.0	20.83	355.59
EchoStar Communication	517510	Subscribers	1998-2005	Quarterly	5490.5	-9.67	124.59
eCollege	541511	Distance student enrollments	2000-2005	Quarterly	67.0	4.89	205.50
eLoyalty	541611	Customers	1999-2005	Quarterly	99.3	1.94	NA
Health Net	524114	Health plan membership	2001-2005	Quarterly	3572.3	2.68	32.61
Humana	621491	Medical membership	1999-2005	Quarterly	4933.6	1.61	17.19
Insight Communications	515210	Revenue generating units	2000-2005	Quarterly	3657.4	1.22	NA
Interwoven	511210	Customers	2000-2005	Quarterly	382.8	3.33	423.50
iPass	561990	Forbes Global 2000 customers	2003-2005	Quarterly	225.5	2.66	24.84
Molina Healthcare	524114	Medical membership	2003-2005	Quarterly	499.6	3.05	23.30
National Discount Broker	523120	Customer accounts	1999-2000	Monthly	377.3	2.41	19.63
Netflix	532230	Subscribers	2000-2005	Monthly	208.7	7.17	467.33
SIRIUS Satellite Radio	515112	Subscribers	2002-2005	Monthly	1703.0	5.79	NA
Strayer Education	611310	Student enrollments	1998-2005	Quarterly	144.5	11.45	31.54
TD Waterhouse	523120	Active accounts	1999-2001	Monthly	10148.8	2.58	37.79
UnitedHealth	524114	HealthCare&Unipri membership	1997-2005	Quarterly	15073.9	4.52	20.09
Webstreet	523120	Active accounts	2000-2001	Monthly	79.60	2.19	NA
WellChoice	524114	Medical membership	2003-2005	Quarterly	3257.2	2.27	17.16
WellPoint	524114	Medical membership	1997-2004	Quarterly	21658.5	1.99	14.94
WellPoint	524114	Medical membership	2002-2005	Quarterly	7868.8	3.23	16.15
Western Wireless	517210	Global subscribers	1996-2005	Quarterly	1982.1	-6.36	78.08
XM Satellite Radio	515112	Subscribers	2000-2005	Monthly	1623.0	14.36	NA

List of the 31 firms in our sample with descriptive data and the reported metric used to measure the number of customers. Industry classification is based on NAICS 2007 industry codes obtained from the COMPUSTAT database. Sample covers fiscal year-ending periods between January 1995 and December 2005. For each firm, we report sample period, disclosure frequency, firm size (measured as average total assets), average market-to-book ratio M/B, and the average price-earnings ratio P/E.

The firms range in size from eCollege with $67 million average book value of assets to Charles Schwab with $29933 million average asset value, with a median firm size of $1982 million. The median market-to-book (M/B) ratio of sample firms is 2.98, and ranges from -9.67 for EchoStar to 20.83 for eBay. In fact, only two of our 31 firms have positive M/B ratios less than the median U.S. firm's ratio of 1.77 (the ratio of market price to book value of equity for U.S. stocks is the average obtained from the 50th

percentile of price to book values from 1995 to 2005 using data from Kenneth French's website.). EchoStar and Western Wireless have negative M/B ratios, reflecting write-offs leading to negative book values. Firms have price-earnings (P/E) ratios ranging between 14.94 for WellPoint to 467.33 for Netflix, with a median P/E ratio of 30.34 (Since negative price-earnings multiples are not meaningful, we do not report P/E ratios for 5 firms in our sample.). Table 1 also lists the disclosure frequency for each firm (monthly or quarterly).

Financial Metrics

The financial accounting data for January 1994 through December 2005, such as revenues, customer acquisition expenditure, and service expenditures, are obtained from the firm's press releases and SEC filings. The stock market data, such as daily stock returns, are obtained from the Center for Research in Security Prices (CRSP) database. Data to calculate the other financial accounting variables such as book value, earnings, size, and the various growth proxies are obtained from the COMPUSTAT database.

Realized earnings and forecasted earnings, measured by median analyst forecast of EPS immediately before the announcement date, are obtained from the First Call and I/B/E/S databases. Realized earnings, as reported in First Call and I/B/E/S, are un-restated earnings; thus represent the actual reported figure on the announcement date. For a variety of reasons (e.g., incorrect reporting or non-reporting of estimate changes) analyst estimates in the First Call or I/B/E/S databases may be inaccurate. Hence, we used median value of consensus estimates to calculate unexpected earnings. These are used to compute unexpected earnings, UE. Realized earnings were obtained from First Call, and augmented with data from I/B/E/S if necessary. The median analyst consensus estimates are listed in First Call Summary Statistics. If the statistic was not listed in this form, we calculated the necessary statistics from analyst's individual estimates in First Call or I/B/E/S. In line with Gupta, Lehmann, and Stuart (2004), we use selling and marketing expenses reported by the firm to proxy for customer acquisition expenditure. This is not a precise measure, since some portion of this expense may go towards customer service. Nevertheless, several studies have found that the proportion of marketing-related expenditure directed toward customer acquisition is significantly higher than that directed toward customer retention (Reichheld 1996). Thomas (2001) estimates that it takes twelve times more marketing spending to acquire a customer than it does to retain them (initial acquisition cost per customer to be $26.94 versus annual retention cost per customer of $2.15). Firms do not report any directly identifiable measure of customer service expenditure. One could argue that the service industry firms that make up our sample invest primarily in acquiring customers and in serving them. Consequently, our measure of customer service expenditure is calculated as the difference between total operating expenditure and marketing expenditure. Our measure of customer service and customer acquisition is a break-up of the "organization capital" studied by Lev and Radhakrishnan (2005). They find that this measure is relevant to measuring firm value, but financial analysts may not fully incorporate it in valuations since it does not appear on financial statements.

EMPIRICAL RESULTS

Value Relevance Model

The final merged database of our hand-collected data, CRSP data, and COMPUSTAT data has 170 observations when using our first measure of new customers, NC. These are cases where the company discloses the number of new customers. The alternative measure, quarterly net change in total customers, provides 517 observations because it can be calculated for all firms. Table 2 reports summary statistics for the variables in our empirical model. As expected, the market values of firms in our sample greatly exceed their book values. Also, the median values of both our GROWTH variables are positive, indicating that firms in our sample increase investments in capital expenditures and R&D relative to their book values. Since few firms disclose quarterly R&D numbers, the alternate measure of our GROWTH

variable has fewer observations. Though the median service cost per customer (SPC) is $287, it ranges from $9 per customer to $3.6 million per customer. Similarly, when using change in total customers to measure new customers, acquisition costs per customer (APC) varies between -$2.0 and $5.4 million per customer, with a median $727 spent per customer. When using the quarterly net change in total customers, may get negative APC figures if the number of total customers declines. For the smaller sample of firms that report new customers, the range for APC is $30 to $2 million with a median of $272.

Table 3 reports regression tests of the value relevance model in equation (1) for each measure of NC separately. The growth variable (GROWTH) is defined as the change in ratio of capital expenditure to book value of assets. As expected, we find a positive relation between market value (MV) and book value (BV). The relations are significant at the 1 percent level for both measures of NC. Also, as expected, we do not find a significant relation with earnings E.

We find only weak evidence supporting hypotheses 1 and 2. First, SPC and APC are significantly related to market value, but only for high growth firms when we use our more inclusive measure of new customers. For high-growth firms, investors mark down stocks with high service costs and mark up stocks with high acquisition costs. This could mean that investors believe that high service costs indicate operating inefficiencies, while the negative effects of high acquisition costs are swamped by the positive long-term investment benefits of customer acquisition. At least for our sample, spending more to acquire customers pays off.

Table 2: Summary Statistics of the Various Variables Used in Value Relevance Regression Model

Variables	Observations	Median	Mean	Standard Deviation	Minimum	Maximum
MV	605	28.420	36.352	30.955	0.6400	241.250
BV	605	6.855	8.410	10.153	-59.994	65.579
E	605	0.1200	0.1487	0.4570	-1.760	1.970
SPC ($1000)	598	0.2867	94.632	400.44	0.0090	3625.8
APC ($1000) - *NEW CUSTOMERS*	183	0.2720	86.481	296.70	0.0304	2037.8
APC ($1000) - *TOTAL CUSTOMERS*	584	0.7273	1210.06	5179.10	-2049.6	54100.0
GROWTH - *CAPEX*	580	0.0029	0.0002	0.0349	-0.3110	0.1245
GROWTH - *R&D*	124	0.0001	-0.0002	0.0055	-0.0351	0.0298

The model is: $MV_{jt} = \beta_0 + \beta_1 BV_{jt} + \beta_2 E_{jt} + \beta_3 SPC_{jt} + \beta_4 APC_{jt} + \beta_5 (GROWTH_{jt} * SPC_{jt}) + \beta_6 (GROWTH_{jt} * APC_{jt}) + e_{jt}$ *The variables are defined as market price per common share MV, book value per share of common equity BV, earnings per share E, service cost per (total) customer SPC, and acquisition cost per new customer APC. New customers used to calculate APC is measured in two ways, (1) number of new customers reported by some firms, and (2) quarterly change in total customers reported by all firms in our sample. GROWTH indicates growth opportunities available to the firm measured in two ways, (1) the change in the ratio of capital expenditure to book value of assets, and (2) the change in the ratio of R&D expenditure to book value of assets. The sample includes panel data for 31 firms covering quarterly financial periods between January 1995 and December 2005.*

We also tested the model using the alternate measure of GROWTH (the change in ratio of R&D to book value of assets). Unfortunately, few firms in the COMPUSTAT database report quarterly R&D, which significantly reduces our sample sizes. Results using the smaller samples are similar to those presented in Table 3. We also tested the value relevance model using gross, rather than per share MV, BV and E. The results were essentially the same. Compared to a levels model like the value relevance model, a change model like the ERC model could provide stronger tests of the relations because it relies on incremental changes measured during a short event window. The abnormal return used as the independent variable should isolate the effects of the variables of interest more precisely.

Table 3: Regression Results of the Value Relevance Model

	Estimates Using Alternative Measures Of New Customers			
Independent Variables	**New Customers As Reported By Firms**		**Change In Total Customers**	
BV	2.509 (5.34)	***	1.395 (8.94)	***
E	-2.893 (-0.67)		-1.568 (-0.53)	
SPC #	3.420 (0.20)		0.001 (0.16)	
APC *	-0.001 (-0.61)		0.001 (0.33)	
GROWTH*SPC #	-3.513 (-0.21)		-1.682 (-2.30)	**
GROWTH*APC #	0.766 (0.21)		1.630 (1.76)	*
Intercept	69.139 (5.21)	***	40.236 (2.72)	***
Adjusted r-squared	0.631		0.372	
Observations	170		517	

The model is: $MV_{jt} = \beta_0 + \beta_1 BV_{jt} + \beta_2 E_{jt} + \beta_3 SPC_{jt} + \beta_4 APC_{jt} + \beta_5 (GROWTH_{jt} * SPC_{jt}) + \beta_6 (GROWTH_{jt} * APC_{jt}) + e_{jt}$. The dependent variable is the market price per common share MV. The independent variables are book value per share of common equity BV, earnings per share E, service cost per (total) customer SPC, and acquisition cost per new customer APC. New customers used to calculate APC is calculated in two ways, (1) number of new customers reported by some firms, and (2) quarterly change in total customers reported by all firms in our sample. Results using the former calculation are reported in the first column, and the latter calculation in the second column. The control variable GROWTH indicates growth opportunities available to the firm, measured as the change in ratio of capital expenditure to book value of assets. Student t-statistics are reported in parentheses. Sample includes panel data for 31 firms covering quarterly financial periods between January 1995 and December 2005. Both regressions include dummy variables for each firm and each year (not reported in table to save space).
, **, * indicate significance at the 10%, 5% and 1% level respectively. # Divide estimate by 10,000.*

Earnings Response Coefficient Model

Table 4 lists descriptive statistics for the variables used in tests of the ERC model. Because percent changes are used, there is one less observation for each firm in the database. Firms that report customer metrics monthly make up 28.4 percent of the observations in our sample. Most firms in the sample have positive earnings surprises (UE) with a median (mean) surprise of 1 cent per share (1.8 cents per share). As expected, this surprise is impounded in stock prices with a median (mean) positive cumulative abnormal return of 0.44 percent (0.404 percent) around the announcement date.

The ratio of service to acquisition costs, STA, for the smaller sample of firms that report new customers, has a median value of 0.345 (mean of 0.476), confirming that firms spend considerably less servicing existing customers than acquiring new ones. Using our alternate measure of new customers (the quarterly net change in total customers), the median value is 0.127 (mean of 0.216). High-growth opportunities firms' observations comprise 33.4 percent of the sample.

Table 5 reports regression results for the ERC model using the smaller sample of firms that report new customers. The sample contains 163 firm-quarter observations. For robustness, we report results for two specifications; one with GROWTH defined as a continuous variable and the other with GROWTH defined as an indicator variable. As expected, UE and cumulative abnormal returns (CARs) are positively related. The relation is significant (p-value < 0.01) using the GROWTH indicator variable. And as predicted in Hypotheses 3, firms with larger STAs have larger ERCs. But inconsistent with Hypothesis 4, we find firms that disclose more frequently have smaller ERCs. But the negative estimates on FREQ are statistically weak (p-value < 0.10 using the continuous GROWTH variable and insignificant otherwise).

Table 4: Summary Statistics of the Variables Used in the Earnings Response Coefficient (ERC) Model

Variables	Observations	Median	Mean	Standard deviation	Minimum	Maximum
CAR	584	0.0046	0.0040	0.1125	-0.6579	0.7315
UE	605	0.0100	0.0180	0.1451	-0.7200	1.950
STA - *New Customers*	183	0.3448	0.4757	0.3861	0.0443	2.241
STA - *Total Customers*	584	0.1274	0.2165	0.6525	-3.266	5.027
FREQ	584	0.0000	0.2842	0.4514	0.0000	1.000
GROWTH - *Continuous*	605	2.941	4.089	13.469	-94.632	181.07
GROWTH - *Discrete*	605	0.0000	0.3338	0.4719	0.0000	1.000
Size	605	21.898	21.537	1.769	16.932	24.663

The model is: $car_{jt} = \alpha_0 + \alpha_1 ue_{jt} + \alpha_2(sta_{jt}*ue_{jt}) + \alpha_3(freq_{jt}*ue_{jt}) + \alpha_4(growth_{jt}*sta_{jt}*ue_{jt}) + \alpha_5(growth_{jt}*freq_{jt}*ue_{jt}) + \alpha_6(mtb_{jt}*ue_{jt}) + \alpha_7(size_{jt}*ue_{jt}) + e_{jt}$ The variables are the cumulative abnormal return CAR over daily event window [-2,1], unexplained earnings (or earnings surprise) UE, the ratio of service cost per total customers to acquisition cost per new customer STA, and the frequency of disclosure of customer metrics by the firm FREQ. New customers used to calculate STA is measured in two ways, (1) number of new customers reported by some firms, and (2) quarterly change in total customers as reported by all firms in our sample. FREQ is an indicator variable that takes the value 1 if the firm discloses these metrics on a monthly basis, and 0 otherwise. GROWTH indicates growth opportunities available to the firm measured as the market-to-book ratio (for the continuous form). An alternate discrete measure of GROWTH takes the value 1 if market-to-book ratio (growth opportunities) is high (greater than 4), and 0 otherwise. In line with earlier studies, the market-to-book ratio MTB, and the natural logarithm of assets SIZE are included as control variables. The sample includes panel data for 31 firms covering quarterly financial periods between January 1995 and December 2005.

Table 5: Regressions Results of the Earnings Response Coefficient (ERC) Model Using New Customers Measured as the Number of New Customers Reported by Some Firms

	Estimates Using Alternative Measures Of Growth			
Independent Variables	**Continuous Growth**		**Discrete Growth**	
UE	7.225 (1.60)		12.073 (2.75)	***
STA*UE	4.506 (2.27)	**	2.446 (1.90)	*
FREQ*UE	-1.458 (-1.72)	*	-0.399 (-0.65)	
GROWTH*STA*UE	-0.683 (-2.42)	**	-3.499 (-2.03)	**
GROWTH* FREQ*UE	0.435 (2.29)	**	2.323 (2.02)	**
MTB*UE	0.229 (2.77)	***	0.049 (2.23)	**
SIZE*UE	-0.365 (-1.89)	*	-0.548 (-2.83)	***
Intercept	0.041 (0.35)		0.156 (1.33)	
Adjusted R-Squared	0.188		0.171	
Observations	163		163	

*The model is : $car_{jt} = \alpha_0 + \alpha_1 ue_{jt} + \alpha_2(sta_{jt}*ue_{jt}) + \alpha_3(freq_{jt}*ue_{jt}) + \alpha_4(growth_{jt}*sta_{jt}*ue_{jt}) + \alpha_5(growth_{jt}*freq_{jt}*ue_{jt}) + \alpha_6(mtb_{jt}*ue_{jt}) + \alpha_7(size_{jt}*ue_{jt})e_{jt}$The dependent variable is the cumulative abnormal return CAR over daily event window [-2,1]. The independent variables are unexplained earnings (or earnings surprise) UE, the ratio of service cost per total customers to acquisition cost per new customer STA, and the frequency of disclosure of customer metrics by the firm FREQ. New customers used to calculate STA is measured as the number of new customers reported by some firms. FREQ is an indicator variable that takes a value 1 if the firm discloses these metrics on a monthly basis, and 0 otherwise. Control variable GROWTH indicates growth opportunities available to the firm measured as the market-to-book ratio (for the continuous form). An alternate discrete measure of GROWTH takes value 1 if market-to-book ratio (growth opportunities) is high (greater than 4), and 0 otherwise. In line with earlier studies, the market-to-book ratio MTB, and the natural logarithm of assets SIZE are included as control variables. Student t-statistics are reported in parentheses. Sample includes panel data for 31 firms covering quarterly financial periods between January 1995 and December 2005. Both regressions include dummy variables for each firm and each year (not reported in table to save space). *, **, *** indicate significance at the 10%, 5% and 1% level respectively.*

As predicted in Hypothesis 5, these relations differ between high growth and low growth firms using either GROWTH variable. Indeed, the signs of the relations may differ between high and low growth

firms. The positive relation between STA and ERCs is weaker and perhaps negative for high growth firms. And the negative relation between FREQ and ERCs is weaker and perhaps positive for high growth firms. One can interpret these results as follows. Relatively high service spending makes low growth firms earnings more predictable, but this may not hold for high growth firms. And firms that disclose more frequently could have inherently less predictable earnings (whether they are high growth or not), but more frequent disclosure by high growth firms significantly moderates their earnings uncertainty. Indeed, Fraser, Tarbert, and Tee (2009) find that that stock return response to financial news is lower on average for industries with relatively high intangible assets. Our sample is composed of relatively high growth companies that typically have greater intangible assets; hence, we could be picking up the same negative effect. Furthermore, it makes sense that the firms with the least predictable earnings would respond by issuing customer metrics monthly instead of quarterly.

Finally, the signs of the estimates on the control variables MTB (positive and significant) and SIZE (negative and significant) are in line with results from previous studies. Table 6 reports test results for the ERC model using the change in total customers as an alternate measure of NC. The sample is much larger (504 observations). Overall, the results from the larger sample are statistically weaker, perhaps because the change in total customers is a noisy proxy for the true number of new customers. The change in total customers combines new customers with customers lost due to attrition. Nevertheless, relations between CAR and UE, MTB, and SIZE are maintained. But STA and FREQ no longer have a statistically significant impact on ERCs, except for high growth firms.

Table 6: Regressions Results of the Earnings Response Coefficient (ERC) Model Using New Customers Measured as the Quarterly Change in Total Customers

Estimates Using Alternative Measures of Growth				
Independent Variables	**Continuous Growth**		**Discrete Growth**	
UE	2.830 (2.41)	**	2.441 (2.11)	**
STA*UE	-0.270 (-1.64)		-0.248 (-1.52)	
FREQ*UE	0.206 (1.30)		0.144 (0.94)	
GROWTH*STA*UE	-0.055 (-2.19)	**	-1.151 (-2.17)	**
GROWTH* FREQ*UE	0.024 (1.08)		0.820 (2.09)	**
MTB*UE	0.009 (2.06)	**	0.001 (0.68)	
SIZE*UE	-0.119 (-2.28)	**	-0.099 (-1.95)	*
Intercept	-0.011 (-0.10)		-0.010 (-0.09)	
Adjusted R-Squared	0.091		0.089	
Observations	504		504	

The model is: $car_{jt} = \alpha_0 + \alpha_1 ue_{jt} + \alpha_2(sta_{jt}*ue_{jt}) + \alpha_3(freq_{jt}*ue_{jt}) + \alpha_4(growth_{jt}*sta_{jt}*ue_{jt}) + \alpha_5(growth_{jt}*freq_{jt}*ue_{jt}) + \alpha_6(mtb_{jt}*ue_{jt}) + \alpha_7(size_{jt}*ue_{jt}) + e_{jt}$*The dependent variable is the cumulative abnormal return CAR over daily event window [-2,1]. The independent variables are unexplained earnings (or earnings surprise) UE, the ratio of service cost per total customers to acquisition cost per new customer STA, and the frequency of disclosure of customer metrics by the firm FREQ. New customers used to calculate STA is measured as the quarterly change in total customers as reported by all firms in our sample. FREQ is an indicator variable that takes a value 1 if the firm discloses these metrics on a monthly basis, and 0 otherwise. Control variable GROWTH indicates growth opportunities available to the firm measured as the market-to-book ratio (for the continuous form). An alternate discrete measure of GROWTH takes value 1 if market-to-book ratio (growth opportunities) is high (greater than 4), and 0 otherwise. In line with earlier studies, the market-to-book ratio MTB, and the natural logarithm of assets SIZE are included as control variables. Student t-statistics are reported in parentheses. Sample includes panel data for 31 firms covering quarterly financial periods between January 1995 and December 2005. Both regressions include dummy variables for each firm and each year(not reported in table to save space). *, **, *** indicate significance at the 10%, 5% and 1% level respectively.*

Robustness Tests

We ran additional tests to examine the robustness of our results. Overall, we found the results to be quite robust.First, we re-ran all of the regressions and included industry dummies along with the time and firm-specific dummies. We found a significant change in the intercepts but nothing else. Second, we ran the regressions after excluding observations with negative earnings. Results were little changed. Finally, we tested whether customer metrics drive analyst earnings estimates. We found no significant relations between changes in our metrics and changes in mean analyst earnings estimates. This is a bit surprising because we know that some analysts discuss customer metrics in their investment reports to clients. Nevertheless, Tables 3, 5, and 6 show that customer metrics help explain firm value, even in the presence of traditional financial metrics such as earnings, book value, and earning surprises. Indeed, customer metrics are incrementally informative, particularly for high growth firms.

CONCLUSIONS

We test for the information content of customer metrics, as compared to earnings, book value and analyst estimates. We test whether investors use customer metrics to value high growth service firms. Customer metrics are now more frequently reported by firms and tracked by Wall Street analysts. Specifically, we test for the effects of customer metrics on firms' market values and stock price changes using the value relevance and earnings response models.

We use data on customer metrics for 31 firms from 1994-2005 obtained primarily through manual collection from 10-K and 10-Q filings, and press releases. Our hypotheses are tested using the value relevance and the earnings response coefficient (ERC) models. Since the value relevance model examines stock prices and the ERC model examines stock returns, their findings may complement each other.Results using the value relevance model are relatively limited, perhaps because the model relies on variables measured in levels as opposed to changes (see Holthausen and Watts (2001) and Kothari and Shanken (2003) for comprehensive critiques of the value-relevance models). Nevertheless, we find some evidence that investors boost the stock prices of high growth firms that spend more on customer acquisition, and discount the stock prices of high growth firms that spend more on customer service.

A change model like the earnings response model may better identify the marginal relations between firm value and customer metrics because our sample includes many high growth firms where change is the norm. Indeed, the earnings response model results largely support our hypotheses. A firm's ratio of customer service to acquisition spending and their disclosure frequency both significantly affect their earnings response coefficients (ERCs), showing that each affects firm value.

We also find that value effects can differ between high growth and low growth firms. The effects are in the expected direction, except for the effect of disclosure frequency, which is weakly negatively related to ERC. One would expect greater disclosure to reduce earnings uncertainty, making investors more sensitive to any earnings surprise. One possible explanation of these results is that firms with inherently uncertain earnings are more likely to disclose frequently, so that our frequency indicator variable picks up this unobservable uncertainty. This explanation is consistent with the fact that frequent disclosers are the higher growth firms, on average. Furthermore, we find that the negative effect can actually be reversed for high growth firms, that is, frequent disclosure improves high growth firms' earnings predictability, even if their earnings are naturally more uncertain than those of other firms.

Our results show that customer metrics are relevant in firm valuation, and when applied alongside traditional financial performance measures, better explain firm value, particularly for high-growth service firms. Further research is needed to identify efficient proxies for the number of new customers. While many firms report some measure of total customers, few firms report that for the number of new

customers. Another proxy would validate our theoretical model for a larger sample of firms, and more accurately measure the value of intangible customer assets.

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IS THE VALUE EFFECT SEASONAL? EVIDENCE FROM GLOBAL EQUITY MARKETS

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ABSTRACT

This paper extends the research on value premium by examining patterns of seasonality exhibited in the book-to-market effect in major global equity markets. The results provide evidence supporting the January effect in the value premium phenomenon. Using stock market indices for Asia Pacific; Europe, Australasia, and Far East (EAFE); and Europe, with and without the U.K., Scandinavian countries, the U.K., U.S., and Japan form 1975 through 2007, the paper provides out-of-sample evidence from twenty-one countries that comprise different index portfolios. As a robustness measures, we use regression analysis, paired means tests, and non-parametric tests to examine whether the persistence of the anomalous January value premium is real and significant. The annualized excess January value premium ranges from 42.96 percent for Scandinavian countries to 9.24 percent for EAFE markets with 20.28 percent for U.S. Even though such a predictable pattern exists, our analysis suggests that large standard deviations would not allow a viable investment strategy.

JEL: G12

KEYWORDS: Value premium, International equity market, January effect

INTRODUCTION

Long-term investment data makes it clear that value stocks (firms with high book-to-market equity ratios) outperform growth stocks (firms with low book-to-market equity ratios). This book-to-market (B/M) equity effect, also known as value premium, is persistent over time and across regions (see for example, Chan, Hamao, and Lakonishok, 1991; De Bondt and Thaler, 1985, 1987; Fama and French, 1992, 1995, 1996, 1998; Haugen and Baker, 1996; Lakonishok, Shleifer, and Vishny, 1994). The finance literature provides several competing explanations for this value premium. These explanations vary from usage of a bad model for controlling risk (Black and Fraser, 2004; Fama, 1998; Fama and French, 1995, 1996, 1998; Kiku, 2006; Lakonishok, Shleifer, and Vishny, 1994; Lettau and Ludvigson, 2001; Petkova and Zhang, 2005; Zhang, 2005), behavioral biases (Daniel, Hirshleifer, and Teoh, 2001; De Bondt and Thaler, 1987; Haugen, 1995; Hirshleifer, 2001; Kothari, 2000; Lakonishok, Shleifer, and Vishny, 1994), random occurrences (Kothari, Shanken, and Sloan, 1995), to simply a case of data snooping (Lo and Mackinlay, 1990). The value premium remains a puzzle in spite of considerable research effort in finding an explanation for the higher returns earned by value stocks relative to growth stocks. Our paper extends the research on value premium by examining the pattern of seasonality exhibited in book-to-market effect in the major global equity markets. While value premium has been persistent, the important research question is whether there is a predictable pattern to the premium. In addition, if any such pattern in value premium exists, does it provide profitable arbitrage opportunities to investors?

Our results provide evidence of January effect in the value premium phenomenon. The consistent result across all major indices ensures that seasonal pattern in value premium is not the result of data mining. Using stock market indices for Asia Pacific, EAFE (Europe, Australasia, and Far East), Europe (with and without the U.K.), Scandinavian countries, the U.K., U.S., and Japan across time period 1975 through 2007, our study provides out-of-sample evidence from twenty-one countries that comprise different index

portfolios. As robustness measures, we use regression analysis, paired means t-tests, and non-parametric tests to examine whether the persistence of anomalous January value premium is real and significant.

Our empirical analysis shows that the annualized excess January value premium ranges from 42.96 percent for Scandinavian countries to 9.24 percent for EAFE markets with 20.28 percent for U.S. These findings are important to investors seeking to understand and exploit market anomalies such as seasonality and value effect. Even though such predictable pattern exists, our analysis suggests that large standard deviations would not allow a viable investment strategy.

This article is organized as follows. Section II is a discussion of the literature relevant to our current study. In Section III, we present the data and methodology to form portfolios. We conduct our empirical analysis in Section IV. More specifically, we examine the monthly distribution of the value premium using mean and regression tests and present robustness measures employing paired means tests, non-parametric tests, and asset-pricing regression models. Section V concludes the article.

LITERATURE REVIEW

It has been well established in the finance literature that the average stock returns are significantly higher in January than in any other calendar months. This January effect was first identified by Wachtel (1942) who shows that odds in favor of rise in stock price are higher compared to odds in favor of price decline. Subsequently, three decades later, Rozeff and Kinney (1976) analyze the stocks listed on New York Stock Exchange (NYSE) and find that average monthly returns are higher in January than non-January months. During the sample period of 1904-1974, the equal-weighted index of stocks listed on NYSE generated an average return of 3.5 percent in January compared to 0.5 percent in rest of months of the year. Gultekin and Gultekin (1983) show that January effect is not limited to U.S. equity market but prevalent in the global market. In their study of 16 developed equity markets globally, they find evidence of January effect in 15 countries. Roll (1983) and Reinganum (1983) find that the January effect is more pronounced in small firms. In addition, Keim (1983) also finds that small firms outperform large firms mainly in January. Blume and Stambaugh (1983) adjust for bid-ask bias in the measurement of small-stocks' returns and find that size effect is limited to January.

The persistence of January effect over a long period of time has fascinated finance researchers. Several explanations have been offered for the January effect. Roll (1983) and Reinganum (1983) argue that January effect is an outcome of tax-loss selling by investors. Several other studies provide evidence supporting tax-loss selling hypothesis. For example, Poterba and Weisbenner (2001), Jones, Lee, and Apenbrink (1991) examine the effect of changes in income tax rules on January effect; Brown, Keim, Kleidon, and Marsh (1983) examine January effect in Australia where tax year is in July; Berges, McConnell, and Schlarbaum (1984) examine Canadian market where there are no capital gains taxes.

Haugen and Lakonishok (1987) and Lakonishok, Shleifer, Thaler, and Vishny (1991) provide another explanation of January effect based on window-dressing hypothesis. They argue that institutional investors sell poorly performing stocks in December before disclosing their portfolios to SEC. The institutional investors engage in window-dressing to make their portfolio attractive to their clients. Once they fulfil their disclosure requirement, they buy back those shares in January resulting in their higher returns. Barry and Brown (1984) propose a hypothesis based on differential information to explain January effect whereas Bhardwaj and Brooks (1992) and Cox and Johnston (1998) argue that January effect is an outcome of market microstructure biases related to bid-ask bounce. Chen and Singal (2004) conduct a study to compare different explanations proposed for January effect and conclude that tax-selling hypothesis is the most plausible factor driving the January effect.

Several studies document the value effect. Basu (1977) finds that risk-adjusted returns of stocks with high ratio of B/M is superior to those of stocks with low ratio of B/M. Chan, Hamao, and Lakonishok (1991) analyze the Japanese stocks and find that value firms consistently outperform growth firms. Capaul, Rowley, and Sharpe (1993) investigate the value effect in six developed equity markets and find evidence of superior performance of value stocks compared to growth stocks in all six countries in their sample. Fama and French (1998) use the B/M ratio to separate value and growth stocks and provide evidence supporting value effect in thirteen countries during the sample period of 1975-1995. Fama and French (1993) and Davis, Fama, and French (2000) provide evidence of existence of value premium in post-1963 and pre-1963 data, respectively. Fama and French (1993) and Lakonishok, Shleifer, and Vishny (1994) suggest that B/M ratio is a proxy for distress risk. Fama and French (1993) argue that higher returns generated by value stocks are a compensation for higher systematic risk. In support of risk-based explanation of Fama and French (1993), Chen and Zhang (1998) find that value firms are associated with low earnings, higher leverage, and more earnings uncertainty.

Several studies report evidence of January seasonal related to value premium. Fama and French (1993) examine risk-adjusted excess stock returns of U.S. stocks and find evidence of January seasonal related to size and value effect. However, they attribute the seasonal variation in size and value premiums to corresponding seasonal variation in the size and book-to-market risk factors. Daniel and Titman (1997) argue that book-to-market is not a proxy of risk. In support of their characteristic model, they study the seasonal patterns of returns generated by different U.S. portfolios sorted on book-to-market. They show that value premium of large firms exists mainly in January. Loughran (1997) and Chou, Das, and Rao (2011) analyze the January effect on value premium and find that large U.S. firms exhibit value premium mainly in January. These studies document a seasonal pattern in the value premium in U.S. stock markets. Arshanapalli, Coggin, and Nelson (2002, 2003) find that value stocks outperform growth stocks mainly in January. However, their risk-based regression models do not find evidence of January effect outside of U.S. Das and Rao (2011) provide evidence of seasonality in Japanese, U.K., and French equity markets. In this paper, we analyze comprehensive global stock market data from 21 countries to study the interaction of value premium and the January effect. Using major international indices, we find that January seasonal in value premium is more prevalent than once thought.

DATA

Our study employs value-weighted monthly portfolio returns for stock markets of Asia Pacific, EAFE, Europe with and without the U.K., Scandinavian countries, the U.K. and U.S. over the period of January 1975 through December 2007. We use book-to-market equity ratios to separate value and growth stocks. At the end of each year *t*, all stocks in each country are sorted on book-to-market equity ratios. Firms in the top 30% (High) of a sort ratio constitute value portfolio and firms in the bottom 30% (Low) form growth portfolios. For each portfolio, the value-weighted return for each month of year *t+1* is calculated using raw return data from Morgan Stanley's Capital International Perspectives (MSCI) for 1975 to 2006 and for 2007 from Bloomberg. The monthly portfolio returns data are obtained from website of Kenneth French (see Fama and French, 1998, for more detailed information about the data).

Table 1 presents the list of countries included in each index portfolio. The return on each index portfolio is value-weighted average of returns on the country portfolios. The weights assigned to the country in index are based on their relative proportions in the MSCI EAFE index. The sample period is from 1975 to 2007. The Morgan Stanley Capital International provides value-weighted return data for each country portfolio. Many countries that are included in the sample have return data starting from 1975. Six countries have starting dates different from 1975 - Austria (1987), Denmark (1989), Finland (1988), Ireland (1991), Malaysia (1994), and New Zealand (1988). According to a report published by MSCI in May 2010, the total country weight of these 21 countries included in this study accounts for more than 82% in the MSCI All Country Investable Marketable Index.

Table 1: International Index Portfolios

Countries	Date of Inception	Asia Pacific	EAFE	Europe without U.K.	Europe with U.K.	Scandinavian Countries	U.K.	U.S.	Japan
Australia	1975	Y	Y						
Austria	1987		Y	Y	Y				
Belgium	1975		Y	Y	Y				
Denmark	1989		Y			Y			
Finland	1988		Y			Y			
France	1975		Y	Y	Y				
Germany	1975		Y	Y	Y				
Great	1975		Y		Y		Y		
Hong Kong	1975	Y	Y						
Ireland	1991		Y		Y		Y		
Italy	1975		Y	Y	Y				
Japan	1975	Y	Y						Y
Malaysia	1994	Y							
Netherlands	1975		Y	Y	Y				
New	1988	Y	Y						
Norway	1975		Y			Y			
Singapore	1975	Y	Y						
Spain	1975		Y	Y	Y				
Sweden	1975		Y			Y			
Switzerland	1975		Y	Y	Y				
U.S.	1975							Y	

This table shows the countries included in each index portfolios. Date of inception is the starting date when country return data is added to the index portfolio.

Table 2 shows the summary statistics of value-weighted monthly dollar returns of market, value (High B/M) and growth (Low B/M) portfolios for each index included in the sample. When compared to standard deviations of non-U.S. markets, the standard deviation of the U.S. market is much lower suggesting higher volatility of stock returns in non-U.S. markets. Consistent with evidence provided in Fama and French (1998), the value portfolios consistently outperform growth portfolios in all markets. For example, the U.S. value stocks earn 1.45 percent monthly return compared to 1.08 percent monthly return of U.S. growth stocks. The standard deviations of High B/M portfolios are greater than those of Low B/M portfolios except for the U.S. market suggesting that value stocks are riskier than growth stocks. The value-growth spread is positive for all markets and ranges from 89 basis points for Japan to 27 basis points for the U.K. market. Importantly, High-Low (value minus growth zero investment portfolio) has lower standard deviation than market, High B/M, and Low B/M portfolios. The higher standard deviations of Scandinavian countries and the U.K. markets compared to Europe (both with and without the U.K.) suggest high volatility of stock returns at country level. Our findings are consistent with Fama and French (1998) who suggest that high volatility of country returns drive down the statistical significance of deviation of the U.K. stock market and Scandinavian stock markets. We find a very significant, large value premium in Asia Pacific, EAFE, and Japan. The effect of value premium is

smaller, yet significant in U.S., Europe without the U.K., and Europe with the U.K. Value premium is economically meaningful, but not significant in the U.K and Scandinavian countries. The value premium is one of the most well documented facts in finance. Our global results confirm that this premium appeared with a high degree of persistence during 1975-2007. Though global value premiums are large, so are their standard deviations, meaning that there are not too many arbitrage opportunities.

Table 2: Portfolio Characteristics of the Sample

	Mean	Std. Deviation	Median	Maximum	Minimum
	Asia Pacific				
Market	1.04***	5.82	1.08	23.11	-17.23
High B/M	1.53***	6.24	1.48	26.24	-15.38
Low B/M	0.73**	6.12	0.65	25.36	-20.06
High - Low	0.80***	4.14	0.63	21.35	-22.38
	EAFE				
Market	1.15***	4.73	1.25	17.79	-14.67
High B/M	1.48***	4.91	1.77	16.73	-16.74
Low B/M	0.97***	4.84	1.02	17.76	-15.16
High – Low	0.51***	2.57	0.31	10.60	-12.76
	Europe without the U.K.				
Market	1.19***	4.77	1.27	15.19	-17.78
High B/M	1.43***	5.24	1.45	19.47	-18.56
Low B/M	1.13***	4.78	1.14	16.80	-19.70
High – Low	0.30**	2.47	0.22	8.81	-12.86
	Europe with the U.K.				
Market	1.25***	4.74	1.40	24.44	-19.79
High B/M	1.47***	5.16	1.65	23.22	-18.95
Low B/M	1.18***	4.75	1.32	25.33	-21.61
High – Low	0.29**	2.35	0.28	9.67	-10.40
	Scandinavian Countries				
Market	1.40***	6.00	1.61	20.66	-19.22
High B/M	1.69***	6.48	1.51	24.29	-19.24
Low B/M	1.37***	6.40	1.33	23.92	-22.12
High – Low	0.32	5.10	0.30	23.07	-21.13
	U.K.				
Market	1.47***	6.28	1.25	54.90	-22.43
High B/M	1.63***	6.88	1.43	52.61	-23.29
Low B/M	1.36***	6.45	1.16	53.42	-24.13
High – Low	0.27	3.54	0.51	14.48	-13.43
	U.S.				
Market	1.43***	3.94	1.62	12.85	-22.54
High B/M	1.45***	4.30	1.66	23.69	-20.37
Low B/M	1.08***	4.77	1.26	14.18	-24.27
High - Low	0.37**	3.01	0.35	14.25	-7.41
	Japan				
Market	1.00***	6.33	0.72	25.92	-18.58
High B/M	1.53***	6.94	1.03	34.78	-15.96
Low B/M	0.64*	6.69	0.38	27.51	-21.58
High - Low	0.89***	4.81	0.66	30.05	-24.63

*This table shows the mean, standard deviation, median, maximum, and minimum of value-weighted average of monthly dollar returns for market, high book-to-market (High B/M), and low book-to-market (Low B/M) portfolios for each index included in the sample. All figures reported are in percent. The sample period is 1975 to 2007. The indices included in the sample are Asia Pacific, Europe, EAFE, Europe (with and without the U.K.), Scandinavian countries, the U.K., U.S., and Japan. The countries included in each index are shown in table 1. *** and ** denote statistical significance at 1% and 5% level respectively.*

EMPIRICAL RESULTS

Monthly Distribution of Value Premium

To address the issue of the seasonal pattern of value effect, we analyze the monthly distributions of the value premium. Table 3 shows the monthly average of value premiums for each index included in the sample. Among months of the year, January is unique. The value premium is economically large and statistically significant in January for all indices. For example, in U.S., the January value premium is

1.92%, which is almost twice that of value premium in February, the month with second highest value premium. More importantly, the value premium is positive and significant only for January. Similarly, the EAFE market shows most pronounced and significant value premium in January. The results of the table clearly indicate a consistent pattern that value premium is mainly a January event.

Table 3: Monthly Distribution of Value Premiums

Months	Asia Pacific	EAFE	Europe without the U.K.	Europe with the U.K.	Scandinavian countries	U.K.	U.S.	Japan
January	1.89*	1.22**	1.09**	1.18**	3.60***	1.28*	1.92**	2.34*
February	1.07	0.68	1.02*	0.53	1.79	-0.24	0.98	1.14
March	0.58	0.73*	1.00**	0.80*	1.30**	0.48	0.80	0.82
April	1.58**	1.08**	0.62	0.65	-0.34	0.61	0.57	1.72*
May	1.11	0.64	0.31	0.23	-0.65	0.15	0.29	1.31
June	2.02***	0.64	-0.56	-0.49	-0.74	-0.44	-0.03	2.30***
July	0.07	0.25	0.16	0.10	1.23	-0.04	0.02	0.09
August	-0.01	-0.21	0.01	-0.23	-0.35	-0.59	0.52	-0.13
September	0.55	0.12	-0.43	-0.29	-0.88	0.11	0.08	0.54
October	0.34	-0.01	-0.29	-0.04	-1.99**	0.26	-0.82*	0.45
November	-0.69	0.04	0.27	0.46	0.01	0.86	-0.17	-1.09
December	1.05	0.91**	0.42	0.54*	0.83	0.73	0.26	1.19

This table shows the average monthly value premium (difference between monthly value-weighted average returns of high book-to-market and low book-to-market portfolios) for each index included in the sample. All figures reported are in percent. The sample period is 1975 to 2007. The indices included in the sample are Asia Pacific, Europe, EAFE, Europe (with and without the U.K.), Scandinavian countries, the U.K., U.S., and Japan. The countries included in each index are shown in table 1. ***, **, and * denote statistical significance at 1%, 5%, and 10% level respectively.

As a robustness test to support our results in table 3, we use the following regression model:

$$\text{Premium}_t = \sum_{i=1}^{12} \gamma_i \text{Dummy}_i + \beta\,(\text{RM}_t - \text{RF}_t) + e_t \qquad (1)$$

where Premium_t is value premium (difference between value-weighted returns of High and Low book-to-market portfolios) for month t, RM_t is either global market (Panel A) or local market (Panel B) returns in U.S. dollars, RF_t is one-month U.S. Treasury bills rate. Dummy_i is a dummy variable with i=1 (January) to i=12 (December) and takes value of 1 in i^{th} month and zero otherwise. Table 4 presents the regressions results. The dummy variable for January is economically large and statistically significant for all groups. Our global results in table 3 present a pattern consistent with our previous table and indicate that value premiums are strong and concentrated mainly in January.

Table 4: CAPM Regressions with Dummy Indicators for Each Month

Panel A: RM = Global N = 396								
	Asia Pacific	**EAFE**	**Europe without the U.K.**	**Europe with the U.K.**	**Scandinavian countries**	**U.K.**	**U.S.**	**Japan**
January	2.09***	1.29***	1.01**	1.12***	3.90***	1.23**	2.14***	2.57***
February	1.12	0.69	1.00**	0.52	1.86**	-0.25	1.03**	1.19
March	0.68	0.77*	0.96**	0.77*	1.46*	0.45	0.92*	0.94
April	1.86***	1.18***	0.52	0.56	0.08	0.53	0.89*	2.05**
May	1.12	0.64	0.30	0.23	-0.63	0.15	0.30	1.33
June	2.05***	0.65	-0.57	-0.50	-0.69	-0.45	0.00	2.33***
July	0.08	0.26	0.16	0.10	1.24	-0.04	0.01	0.10
August	-0.01	-0.21	0.01	-0.23	-0.36*	-0.59	0.52	-0.14
September	0.41	0.07	-0.38	-0.25	-1.08	0.15	-0.07	0.39
October	0.44	0.03	-0.33	-0.07	-1.83**	0.23	-0.70	0.58
November	-0.49	0.11	0.19	0.40	0.31	0.80	0.06	-0.85
December	1.35*	1.01**	0.31	0.45	1.28	0.65	0.60	1.52*
$RM_t - RF_t$	-0.16***	-0.06*	0.06*	0.05*	-0.24***	0.05	-0.18***	-0.18***
Panel B: RM = Local N = 396								
January	1.95***	1.27***	1.07**	1.14***	3.99***	1.26**	1.94***	2.37***
February	1.12	0.72	0.95**	0.49	2.09**	-0.25	1.10**	1.19
March	0.70	0.78*	0.95**	0.77*	1.38	0.48	0.90*	0.98
April	1.75**	1.19***	0.53	0.57	0.06	0.58	0.66	1.87**
May	1.08	0.60	0.37	0.27	-0.76	0.16	0.39	1.27
June	2.03***	0.63	-0.56	-0.48	-0.78	-0.43	0.10	2.32***
July	0.05	0.27	0.14	0.08	1.52*	-0.05	0.06	0.04
August	0.01	-0.21	0.02	-0.24	-0.66	-0.60	0.63	-0.10
September	0.51	0.09	-0.41	-0.26	-0.97	0.12	0.14	0.50
October	0.38	0.03	-0.35	-0.07	-1.78**	0.26	-0.77	0.48
November	-0.68	0.08	0.18	0.41	0.28	0.85	-0.08	-1.08
December	1.26*	1.05**	0.25	0.43	1.27	0.70	0.23	1.36
$RM_t - RF_t$	-0.09**	-0.05*	0.06**	0.04	-0.17***	0.01	-0.08*	-0.08**

The regression model used is: $\mathrm{Premium}_t = \sum_{i=1}^{12} \mathrm{Dummy}_i + \beta(RM_t - RF_t) + e_t$ *where* $\mathrm{Premium}_t$ *is value premium (difference between value-weighted returns of high and low book-to-market portfolios) for month t,* RM_t *is either global market (Panel A) or local market returns (Panel B) in U.S. dollars,* RF_t *is one-month U.S. Treasury bills rate,* Dummy_i *is a dummy variable with i=1 (January) to i=12 (December) and takes value of 1 in i month and 0 otherwise. ***, **, and * denote significance at 1%, 5%, and 10% level respectively.*

Value Premium in January and Non-January Months

Table 5 reports the mean, standard deviation, and median of value-weighted monthly returns of High B/M, Low B/M, and H-L portfolios for January and non-January months. The January value premium is positive, economically large, and statistically significant in all the markets. The value-growth spread in January ranges from 3.6 percent for Scandinavian market, to 1.09 percent for European market without the U.K. The corresponding value premium in non-January months is either economically small or statistically insignificant. The three largest countries in terms of stock market capitalization (U.S., Japan, and the U.K.) have positive value premiums that are not statistically different from zero. Only Asia Pacific and EAFE markets show value premiums statistically significant at 1% level. To analyze whether January value premium is greater than non-January value premium, we conduct paired means t-test between January and non-January value premiums and report the results in the last column (Jan-NonJ) of the table. It is evident from the results of table 5 that January value premium is greater than non-January value premium. The January minus non-January value premium is economically large. For example, the January value premium of Scandinavian countries is 3.60 percent compared to almost negligible value premium (2 basis points) in non-January months. The annualized excess January value premium, calculated by multiplying the difference of average January and non-January value premium by 12, ranges from 42.96 percent for Scandinavian countries to 9.24 percent for EAFE market. U.S., the U.K., and Japan have annualized excess returns of 20.28 percent, 13.32 percent, and 18.96 percent. The excess January value premium is economically large in all cases and statistically significant in five markets. The non-significance of excess value premiums in three cases is an outcome of high volatility. It is important to note that higher returns earned on value stocks in January drive the January value premium.

Table 5: Portfolio Returns for January and Non-January months: Difference of Mean Tests

		January (N=33)			Non-January (N=363)			Jan-NonJ
		High	Low	H-L	High	Low	H-L	(N=33)
	Asia Pacific							
Mean		2.45**	0.56	1.89*	1.45***	0.75**	0.70***	1.19
Std. Deviation		5.81	6.35	6.03	6.28	6.10	3.92	6.40
Median		2.10	0.16	1.60	1.32	0.96	0.57	1.69
	EAFE							
Mean		2.31**	1.10	1.22**	1.40***	0.96***	0.44***	0.77
Std. Deviation		4.87	5.40	3.17	4.92	4.79	2.50	3.52
Median		2.27	0.05	1.37	1.75	1.07	0.27	1.43
	Europe without the U.K.							
Mean		1.78*	0.70	1.09**	1.40***	1.17***	0.23*	0.86*
Std. Deviation		5.10	4.50	2.47	5.26	4.81	2.45	2.57
Median		1.68	0.68	1.33	1.42	1.16	0.19	0.75
	Europe with the U.K.							
Mean		2.38**	1.20	1.18**	1.39***	1.18***	0.21*	0.97**
Std. Deviation		5.71	5.43	2.66	5.11	4.69	2.31	2.71
Median		2.96	0.73	1.22	1.57	1.34	0.23	1.12
	Scandinavian Countries							
Mean		5.77***	2.17**	3.60***	1.32***	1.30***	0.02	3.58***
Std. Deviation		7.48	5.89	6.01	6.26	6.45	4.91	5.92
Median		4.43	2.07	2.37	1.19	1.27	0.24	2.52
				U.K.				
Mean		3.89**	2.60	1.28*	1.42***	1.25***	0.17	1.11*
Std. Deviation		10.67	10.57	3.65	6.42	5.95	3.52	3.64
Median		2.27	0.02	0.81	1.38	1.25	0.46	1.38
	U.S.							
Mean		3.74***	1.82**	1.92**	1.24***	1.01***	0.23	1.69**
Std. Deviation		6.18	5.48	4.40	4.04	4.70	2.82	4.13
Median		3.03	1.97	1.61	1.55	1.15	0.24	1.13
	Japan							
Mean		2.45*	0.11	2.34*	1.45	0.69	0.76	1.58
Std. Deviation		7.63	7.23	7.42	6.87	6.45	4.50	7.80
Median		1.56	-0.10	2.36	0.94	0.43	0.52	2.18

*All firms included in the sample are sorted on the basis of book-to-market (B/M). The top 30 percent of firms in a given country form value portfolios (indicated with High), and bottom 30 percent of firms constitute growth portfolios (indicated with Low). H-L is the difference between returns of high and low B/M portfolios. This table reports the mean, standard deviation, and median of value-weighted monthly returns of High, low, and H-L portfolios for January and non-January months. The last column (Jan-NonJ) shows statistics for excess January H-L over non-January H-L. All returns reported are in percent. The sample period is 1975 to 2007. ***, **, and * represent the significance level at 1%, 5%, and 10% level respectively.*

We next test the hypothesis asserting that January minus non-January value premium is positive each year. Under the null hypothesis, the occurrence of the positive and negative January minus non-January value premium is equally likely (i.e., each result should occur with an equal frequency of 50%). We employ the non-parametric sign-test to investigate whether excess January value premium persists or is an outcome of any random event and report the results in the table 6. The percent positive (frequency) showing the proportion of years with January value premium greater than non-January value premium months suggests that the January value premium is greater than non-January value premium almost two-third of the times. Importantly, the sign-test statistics are significant at all conventional levels of significance. To confirm and further validate our findings reported in tables 5 and 6, we turn to asset pricing tests to explain the January seasonal in the value premium. We use CAPM to test the January effect in the value premium. We follow Fama and French (2006) and use the following test model:

$$\text{Premium}_t = \alpha + \beta(\text{RM}_t - \text{RF}_t) + \gamma * \text{JanDummy} + e_t \quad (2)$$

where Premium_t is value premium (value - growth) for month t, RM_t is market return, RF_t is one-month U.S. Treasury bill rate, and JanDummy, a dummy variable that takes the value 1 if month is January and zero otherwise. We use two different market returns, global market return and local market return. The monthly dollar returns of global and local market are calculated using MSCI indices.

Table 6: Portfolio Returns for January and Non-January Months: Non-parametric Tests

	January (N=33)			Non-January (N=363)			Jan-NonJ
	High	Low	H-L	High	Low	H-L	(N=33)
	Asia Pacific						
Percent positive	69.70	51.52	75.76	59.23	56.20	57.85	63.64
Sign test (z-stat)	139.50	12.00	185.50	8375.00	4505.00	7647.50	134.50
Sign test (prob)	0.01	0.82	0.00	0.00	0.02	0.00	0.01
	EAFE						
Percent positive	66.67	51.52	72.73	64.74	60.88	57.85	72.73
Sign test (z-stat)	140.00	29.50	179.50	11548.00	8461.00	7029.50	131.50
Sign test (prob.)	0.01	0.61	0.00	0.00	0.00	0.00	0.02
	Europe without the U.K.						
Percent positive	69.70	60.61	60.61	63.09	62.26	53.44	63.64
Sign test (z-stat)	116.00	37.50	122.50	11352.00	10641.00	3310.50	106.50
Sign test (prob)	0.04	0.51	0.03	0.00	0.00	0.10	0.06
	Europe with the U.K.						
Percent positive	75.76	57.58	69.70	63.36	64.74	56.75	69.70
Sign test (z-stat)	143.50	59.50	135.00	11370.00	10922.50	3965.50	131.50
Sign test (prob)	0.01	0.29	0.01	0.00	0.00	0.05	0.02
	Scandinavian Countries						
Percent positive	81.82	63.64	63.64	59.50	59.78	52.89	69.70
Sign test (z-stat)	211.00	108.50	149.50	8251.00	8301.50	55.00	161.00
Sign test (prob)	0.00	0.05	0.01	0.00	0.00	0.98	0.00
			U.K.				
Percent positive	69.70	51.52	63.64	61.16	59.50	55.10	66.67
Sign test (z-stat)	137.50	53.00	116.50	8934.00	8589.00	3031.00	112.50
Sign test (prob)	0.01	0.35	0.04	0.00	0.00	0.13	0.04
	U.S.						
Percent positive	75.76	63.64	69.70	65.29	58.68	52.34	72.73
Sign test (z-stat)	191.00	94.50	124.50	13682.50	9209.50	3014.00	121.50
Sign test (prob)	0.00	0.09	0.02	0.00	0.00	0.13	0.03
	Japan						
Percent positive	69.70	45.45	72.73	57.85	57.90	58.95	66.67
Sign test (z-stat)	106.50	-25.50	187.50	7316.50	3298.50	7133.50	142.50
Sign test (prob)	0.06	0.66	0.00	0.00	0.10	0.00	0.01

*All firms included in the sample are sorted on the basis of book-to-market (B/M). The top 30 percent of firms in a given country form value portfolios (indicated with High), and bottom 30 percent of firms constitute growth portfolios (indicated with Low). H-L is the difference between returns of high and low B/M portfolios. This table reports percent positive, sign test, and p value of sign test statistics of value-weighted monthly returns of High, low, and H-L portfolios for January and non-January months. The last column (Jan-NonJ) shows statistics for excess January H-L over non-January H-L. All returns reported are in percent. The sample period is 1975 to 2007. ***, **, and * represent the significance level at 1%, 5%, and 10% level respectively.*

In a CAPM world, we should expect α and γ to be not different from zero. A positive and significant α would indicate presence of value premium in stock returns not captured by the CAPM model. On the other hand, a positive and significant γ implies that January value premium is greater than non-January value premium. We report our results from CAPM regressions in table 7. It is interesting to note that while α is positive and significant in only four groups (U.S., Japan, Asia Pacific, and EAFE), γ is positive and significant in all groups. Furthermore, γ is greater than α in all groups suggesting the economic significance of January value premium.

CONCLUSIONS

The anomalous superior performance of value stocks relative to growth stocks persists; it has not been arbitraged away since it received the attention of financial economists more than three decades ago. Even after decades of research, there is no consensus on the explanation of the persistence and source of value premium. We add to this debate by examining the predictable seasonal pattern of value premium in the major global equity markets. Using value-weighted monthly returns of value and growth portfolios of

Table 7: CAPM Regressions with January Dummy

Panel A: RM = Global N = 396								
	Asia Pacific	**EAFE**	**Europe without the U.K.**	**Europe with the U.K.**	**Scandinavian Countries**	**U.K.**	**U.S.**	**Japan**
α	0.78***	0.47***	0.19	0.17	0.15	0.14	0.32**	0.85**
$t(\alpha)$	3.59	3.45	1.49	1.41	0.54	0.75	2.10	3.38
β	-0.15***	-0.05	0.07**	0.06**	-0.23***	0.06	-0.17***	-0.17*
$t(\beta)$	-2.90	-1.43	2.21	2.16	-3.64	1.37	-4.78	-2.91
γ	1.29*	0.81*	0.81*	0.93**	3.73***	1.07*	1.80***	1.71**
$t(\gamma)$	1.74	1.73	1.83	2.20	4.16	1.67	3.43	1.97
Adj. R Sq	0.02	0.01	0.02	0.02	0.06	0.01	0.07	0.03
Panel B: RM = Local N = 396								
α	0.74***	0.47***	0.18	0.17	0.13	0.16	0.30*	0.80*
$t(\alpha)$	3.42	3.46	1.42	1.37	0.50	0.85	1.85	3.17
β	-0.08**	-0.04	0.06**	0.05**	-0.14	0.02	-0.07*	-0.08**
$t(\beta)$	-2.24	-1.48	2.43	2.07	-3.44	0.58	-1.81	-1.96
γ	1.20	0.79*	0.88**	0.96**	3.80***	1.08*	1.64***	1.57**
$t(\gamma)$	1.61	1.69	1.98	2.26	4.22	1.67	3.03	1.81
Adj. R Sq	0.01	0.01	0.02	0.02	0.06	0.01	0.03	0.02

*The regression model used is where $Premium_t$ is value premium (difference between value-weighted returns of high and low book-to-market portfolios) for month t, RM_t is either global market (Panel A) or local market returns (Panel B) in U.S. dollars, RF_t is one-month U.S. Treasury bills rate, $JanDummy$ is a dummy variable which takes value of 1 if month is January and 0 otherwise. t() is the t-statistics of a regression coefficient, and Adj. R Sq. is the coefficient of determination adjusted for degrees of freedom. The sample period is 1975 to 2007. ***, **, and * represent the significance level at 1%, 5%, and 10% level respectively.* $Premium_t = \alpha + \beta(RM_t - RF_t) + \gamma * JanDummy + e_t$

several global equity markets, we provide empirical evidence supporting existence of pronounced January effect in the value premium. The excess January value premium exists and is economically large in major global indices. During the sample period extending from January 1975 to December 2007, the annualized excess January value premium ranges from 9.24% for EAFE market to 42.96% for Scandinavian countries with 11.64% and 20.28% for Europe without the U.K. and U.S. stock markets.

We perform several tests to ensure robustness of our results. We use two different regression models: (1) we regress market risk premium and dummy variables for each calendar month on monthly value premium and (2) CAPM with a dummy variable for January. The coefficient of January indicator is economically large and statistically significant irrespective of whether we use global or local market returns. The paired means t-tests and non-parametric sign tests further validate and confirm our results of pronounced January value premium. Our study provides several issues for future research. MSCI indices are mainly comprised of large-cap stocks. Our sample (MSCI indices) is biased towards large cap stocks. Future research may examine whether the pronounced January value premium exists in small-cap stocks. Additionally, research may also focus on explanation of January effect observed in value premium. Theory does not explain why value premium of large firms should be concentrated in January. In any case, exploiting this effect and creating a viable investment strategy may be more difficult than it would appear. Even if there is a dependable, predictable pattern in January value premium, it may be the result of data mining or it may not be exploitable by investors due to large standard deviation of the value premium, taxes, and high transaction costs.

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WHY DO INSIDERS SOMETIMES PAY MORE AND SOMETIMES PAY LESS IN PRIVATE PLACEMENTS?

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ABSTRACT

This paper explores private placement pricing sold to insiders by considering changes in the control power of the largest shareholders in private placement. We use the Banzhaf power index to reflect the largest shareholder's relative power of influence. The results indicate that, if existing insiders maintain their leading control status, in cases where insiders are the main investors, private placements are issued at deep discounts that benefit themselves. However, in cases where outsiders/new insiders are the main investors, outsiders and new insiders will pay relatively more when existing insiders dominate. Contrarily, if existing insiders fail to retain their leading position and become less powerful after private placement, outsiders and new insiders buy at lower prices. In more than 65% of the sample, the largest shareholders lost their leading control status, and the issuer's ownership structure becomes more concentrated following private placements. Finally, the findings suggest that motivations of private placement issues have a greater influence on pricing than investor types in private placements.

JEL : G1; G3

KEYWORDS: Private placement discount, power index, control right, self-dealing, ownership structure

INTRODUCTION

Over the last few decades, there has been a dramatic increase in the number of equity private placements. From 1995 to 2006, the number of private placements issued by U.S. corporations increased from 127 to 2,720. The total amount of capital raised via private placement also has increased from $1.87 billion in 1995 to $88.0 billion in 2006. In Taiwan, from October 2001, publicly listed firms have been able to raise equity capital via private placements. The number of private offerings has been increasing annually, while numbers of public offerings have been decreasing. Some firms even conduct multiple private offerings during a single year in Taiwan. The private placement market has emerged as an important choice among corporations for the issuance of follow-on equity financing. Although extant research has focused primarily on public offerings, private placements have recently attracted considerable attention.

Equity private placements are in general sold at a discount. Empirical research shows the average discount of U.S. private equity issues is -11.3%~-20.14%.The average discount of Taiwanese private offerings is about -20%. Why private placements are issued at relatively large discount to the market price? Past literature on the causes of private placement discount mainly focused on the impact of monitoring, illiquidity, management entrenchment and information asymmetry. However, existing studies have ignored the fact that changes in large shareholders' control over the firm may be a key consideration in determining prices.

Prior studies provide some evidence of the association between private placement discount and investor type. For example, Hertzel and Smith (1993) and Barclay, Holderness and Sheehan (2001, 2007), among others, suggested that there is a larger discount for private placement sold to outsiders. The reason for this large discount is to compensate the investors for agency cost or information cost. However, there is no consensus on the discount for private placement sold to insiders. Some studies provide empirical evidence of the *self-dealing hypothesis* where discounts for private placements sold to insiders are higher than discounts for private placements in which insiders do not participate (see Wruck and Wu (2009), Wu (2004), and Hertzel et al. (1993)). Insiders can issue private placements at a greater discount to benefit themselves because private placements tend to draw less attention from investors and regulatory agencies,

and therefore, the incentive for insiders to tunnel tends to be strong in private placements. On the other hand, the *control premium hypothesis* provides a contrasting view of the pricing of issues sold to insiders. This hypothesis suggests that insiders can use their power to extract private benefits; therefore private placement is usually sold to insiders at a premium to reflect private benefits accruing exclusively to the insiders.In view of the seemingly conflicting empirical evidences, one may wonder whether the results of previous studies are conditional only. If indeed the price insiders pay varies in private placement, a natural question is under what conditions will insiders pay more (or less) in private placement? Until recently, no empirical research has been available to answer this question.

This paper reconciles the self-dealing and the control premium hypothesis to clarify the questions of private placement pricing. We posit that the changes in existing insider's control is the key in determining whether offer price will be at a premium or at a discount in private placements. In other words, the price insiders pay is conditional on her relative control power change following private placement. To the best of our knowledge, this is the first study explaining the conditions dictating the price insiders pay in private placement from such perspective. Studies on private placement pricing often use ownership or the percentage of board seats as a measure for control. The control measure of prior studies (ownership, board seats, etc) may not fully reflect shareholder's relative influence. We propose an alternative measure, the voting power index (Banzhaf power index), to evaluate the control power of existing shareholders. The reasoning behind this measurement is that a large shareholder's control power in the board relies not only on its own voting strength but also on the structure of vote distribution. For example, by collaborating with other key minority shareholders, real voting power often differs from what ownership alone can manifest. This is the first article that advocates the idea of applying the power index to examine changes in the controlling shareholders' position in private placement issues.

Perhaps the key contribution of the study is identifying the conditions that explain the price insiders pay in private placement. We find that changes in the controlling power of the largest existing shareholder after the private placement issues can clarify the debate on private placement prices that insiders pay. If the existing largest shareholder maintains her leading control status, outsiders and new insiders would pay more (if they are the main investors) while insiders enjoy a significantly large discount (if insiders are main investors). On the contrary, when the existing shareholder loses the leading position, outsiders and new insiders buy at a lower price. The results of this study indicate that insiders would self-deal by setting a lower price to benefit themselves only if they become more powerful following private placement, but not when a new power dominates after placement. There is no evidence to support the control premium hypothesis. The implication of our empirical results is that private placements are likely to be use a self-dealing vehicle when existing insiders remain dominant control, but not so if there is change in control power.The remainder of this paper is organized as follows. The next section offers a literature review. Section 3 describes the procedures for collecting data on private placements and the characteristics of private placement firms. It also provides a more detailed introduction, and discusses the classification of private placement investors and placement motivations, as well as the measurement of power index. Section 4 presents and discusses the empirical results. Finally, Section 5 gives conclusions and implications.

LITERATURE REVIEW

Several theories have been put forth to explain the potentially sources of private placement discount. First, private placement discounts can be viewed as compensation to the block purchasers for monitoring of management (Wruck, (1989)). However, Barclay, Holderness and Sheehan (2007) argue that pricing discounts reflect implicit compensation to passive investors for helping management solidifying the control of the firm. Sheehan and Swisher (1998)、Silber (1991) point out trading restrictions prevent investors from selling equity, large pricing discount could compensate for the resale restrictions. Finally, Hertzel and Smith (1993) suggest that private placement discounts reflect costs incurred by private investors to assess firm value through their negotiations with management.

Furthermore, several studies have observed that the type of investors in private placements significantly influences price discount. Hertzel and Smith (1993) and Barclay et al. (2007), among others, suggested that there is a larger discount for private placement sold to outsiders. However, the two main lines of previous studies on insider's payment in private placement, control premium and self-dealing hypothesis, have contrasting views about insiders premium. The former suggests insiders will pay more, while the latter suggests insiders will pay less. No study has yet been able to identify the conditions that prompt insiders to pay more or less in private placements. A related paper is Wruck and Wu (2009); they show that management and investors with new governance affiliations in private placement receive a higher discount. Two other important and related papers are by Barclay et al. (2007) and Krishnamurthy, Spindt, Subramaniam and Woidtke (2005). Barclay et al. (2007) find that incumbent managers tend to receive the largest discounts in private placements. In contrast, Krishnamurthy et al. (2005) show that the mean discount in placements to affiliated investors (e.g., directors or current large block shareholders of the firm; etc.) is lower than the discount in placements to unaffiliated investors. These papers focus on the announcement effect of private placements; however, they did not address the question when insiders pay less or pay more and why. In this paper, we provide a clear explanation for the pricing of private placements sold to insiders by considering the variation in control power of the largest shareholders in private placements. Moreover, there are several parties (insiders, outsiders and new insiders who become insiders after private placement) involved in a private placement transaction. An interesting question that follows is how is the price determined when both insiders and outsiders are involved? Few studies can be found exploring the bargaining power among various types of investor parties.

This study attempts to address this issue. Large blocks of new shares are usually sold to one large investor or a small group of investors in private placement. The existing shareholders' control can be threatened or challenged by new large block-holders in private placement issues. Past studies have shown that insiders needing to entrench control rights would generally choose a public listing rather than a private placement (e.g., Zingales (1995), Bebchuk (1999)). Barclay and Holderness (1991) found that there are extensive post-trade managerial and board turnovers (about 33%) one year after negotiated blocks transactions. They also found that 50% of the CEOs hired in the first year after a trade are brought in from the outside, significantly exceeding the normal turnover for public corporations not involved in control transactions. Although there are no lack of studies investigating the relationship between ownership and private placement pricing, however, few empirical studies explore the *changes* in insider's control status and ownership structure of the issuing firm around private placement or investigate whether insiders still have significant control over the firm following private placement. A related and unexplored question is whether the ownership structure becomes more or less concentrated as a result of the block transaction in the private placement? This paper adds to the literature by examining how private placement changes the largest shareholder's influence as well as the concentration structure of ownership.

Furthermore, the control measure of prior studies (ownership, board seats, etc) may not fully reflect shareholder's relative influence. We adopt a better measure, Banzhaf power index, to evaluate the control power of existing shareholders. The power index, reflecting a shareholder's ability to use its vote to change the outcome of voting contests by joining a losing coalition and turning it into a winning one, is a better measure of a large shareholder's relative influence. Classical power indices include two common measurements, the Shaply-Shubik index and the Banzhaf index. These two power indices have been widely used in corporate governance research (see Zingales (1994), Nevova (2003), Chen (2004), Crama et al.(2007), Nicodano et al. (2004), Chung and Kim (1999)). As Leech (2002) noted in his empirical comparison of the performance of these power indices, the Banzhaf index of the largest shareholder is more sensitive to the size of the second largest shareholding, and it is more suitable for measuring the extension of shareholders' control. As there are often new block-holders created in private placement, we believe Banzhaf index is a more suitable measure to reflect the large shareholder's control change. Therefore, this paper adopts the Banzhaf index as a measure of controlling power. By observing the variation in the Banzhaf index in the largest *existing* shareholder (S1) before and after private placement, the influence of private placement on the existing controlling shareholder can be estimated. Additionally, the difference in the Banzhaf power index of the largest (w1) and the second largest (w2) shareholder is used as a proxy measure of ownership concentration.

As well as changes in large shareholders' controlling power and investor type, the motivation for private placement may also be a key factor in explaining private placement pricing. Barclay, Holderness and Sheehan (2007) divided the private placement into three types (active, passive and managerial) according to the post-issue relation between the issuer and private placement investors. In their study it is unclear how investor motivation is identified when there is more than one type of participating investor. Also, investor motivation could have been better verified with news (or reports) after as well as *before* the private issues. In this study, we collect all news or reports associated with each private placement *before* and *after* the announcement to verify the motivations for both the issuing firms and the buyers. The motivations are accordingly divided into four categories: "financial distress", "aggressive", "invited" and "financial need".

DATA AND METHODOLOGY

Data and Summary Statistics

As of October 2001, publicly listed firms in Taiwan have been able to raise equity capital through private placements. The study period in this investigation ran from January 2002 through to May 2007. Private placement data and the identities of individual investors were obtained from the Taiwan Stock Exchange (TSE) and manually sorted. A total of 204 cases were sampled, involving 146 firms. After eliminating cases with incomplete data, 181 observations remained. Table 1 lists the frequency distribution of the private placements and public equity offerings for each year from 2002 to May 2007. The number of private offerings has been increasing annually, while the number of public offerings has been decreasing. Table 1 also reveals that some firms conduct multiple private offerings during a single year. In Table 2, panel A lists the financial fundamentals of the sample firms before the private offer. Generally, private placement firms exhibit poor financial performance, with the average EPS and ROA both being negative. Further, the average private equity issue percentage is about 23%, representing a considerable portion of firm ownership. Table 2 also shows the discounts of private placement based on two criteria.

They are calculated as the difference between the offer price (P_O) and: (A) the market closing price on the first day after the announcement (P_{+1}), (B) the average price over the ten trading days before the announcement (P_{-10}).The negative discount indicates the offer price is lower than the market price, while the positive discount indicates the offer price is higher than the market price. In measuring the private placement discount, we also use the difference between the offer price and the average price over the ten trading days after the announcement. The discount of this measure is the same as the other two measures. Therefore it is not shown here. In Table 2, the median discounts are both negative, averaging -18%. However, significant variation among issues exists, with one third of the observations displaying an offer price premium rather than a discount.

Table 2, panel B classifies private placements by the number of participating investors. Over half (56%) are sold to five or more investors. Only 18% of placements are sold to a single investor, but these samples represent a large proportion (56%) of the sample proceeds. This indicates that private placement equities being broadly held by participating investors in our samples. This finding differs from prior studies which showed most private placements are sold to a small number of investors. For example, Wruck (1989) found 58% of private placements are sold to a single investor, with very few placements sold to more than 6 investors. Wruck and Wu (2009) also report that 65% of the placements in their sample are sold to a single investor.

The Measurement of Power Index

The traditional definition of large shareholder's control over the firm lies within their voting weights. However, the control measure of prior studies (ownership, board seats, etc) may not fully reflect shareholder's relative influence. A shareholder's power actually depends not only on its own voting strength but also on the entire structure of votes allocated to all the other shareholders. That is, large shareholder's power cannot in general be captured by the fractional size of ownership, because it depends

on the distribution of shareholdings. We use the voting power index to propose an alternative variable to capture the control power. A power index measures each shareholder's relative influence over the firm's decision making in the sense of its ability to use its vote to change a coalition of others from one which is losing to one which satisfies the majority requirement and wins. Therefore a power index is calculated for a shareholder by considering each possible coalition of which he or she is not a member and evaluating the number of swings. The algorithm for the power index is described in Leech (2002).

Table 1: Distribution of Private Placements and Public Equity Offerings by Year

	Private Placements		**Public Equity Offerings**	
	Number	**Firm**	**Number**	**Firm**
2002	5	4	57	56
2003	12	10	25	25
2004	17	15	26	26
2005	77	58	38	38
2006	88	54	69	69
2007(until May)	5	5	16	16
Total	204	146	231	230

This table lists the frequency distribution of the private placements and public equity offerings for each year from 2002 to May 2007. The private placement sample includes 204 placements by 146 of TSE (Taiwan Stock Exchange) and OTC firms. The public equity offerings sample includes 231 offerings.

There are two different "classical" power indices, the Shaply-Shubik index and the Banzhaf index (Shapley and Shubik (1954), Banzhaf (1965)). These two power indices have been extensively used in corporate governance research, especially in the applied measure control premium. Leech (2002) proposed an empirical comparison of the performance of these two power indices. He found that the Banzhaf index is more sensitive to the size of the second largest shareholding and is a more suitable measure of the largest shareholder's power. The Banzhaf index is based on the idea of counting the number of swings in relation to all the possible voting outcomes. The probability of a swing for player i is $\beta_i' = 2^{1-n}\sum_{T_i} 1; i = 1, \cdots n$, where T_i are all swings for player i. The normalized Banzhaf index is used in computation, as follows: $\beta_i = \beta_i' / \sum_i \beta_i'$.

To calculate the Banzhaf index, we collect identification and equity ownership data for the top ten shareholders for the year before and follow the private placement from the proxy statements. Knowing both the large shareholder's identity and their shareholdings, we calculate the Banzhaf power index for the largest and second largest shareholder in the issuing firm using an algorithm described in Leech (2002). To clarify the following analysis, the largest and second largest shareholders are defined as w1, w2, respectively, and the largest existing shareholder is defined as S1. By observing the variation in the Banzhaf index in the largest *existing* shareholder (S1) before and after private placement, the influence of private placement on the existing controlling shareholder can be measured. Besides, the difference in the Banzhaf power index of the largest (w1) and the second largest (w2) shareholder is used as a proxy measure of ownership concentration.

Table 2: Private Placement Characteristics

Panel A Fundamental Data of Private Placement Companies

	Mean	Median	Maximum	Minimum
EPS (NT dollars)	-1.8	-1.65	12.87	-10.89
Total assets (NT thousand)	8,466,906	1,577,965	276,000,000	104,120
Debt ratio (%)	57.61%	57.62%	105.82%	2.21%
Marker value (NT million)	6,071,310	577,020	256,074,467	48,700
Total equity (NT thousand)	4,129,987	574,714	145,000,000	-40,405
ROE (%)	-74.66%	-19.56%	606.70%	-2541.64%
ROA (%)	-5.23%	-2.72%	46.35%	-57.89%
Book value (per share)	8.88	7.94	33.89	-0.93
Offer price (per share)	9.95	6.73	140.5	0.4
Percentage issued (%)	22.5%	17.51%	78.95%	0.00%
Proceeds (NT millions)	521	116	22,278	807
Discount A (%)	-2.76%	-18.93%	189.66%	-88.58%
Discount B (%)	-2.32%	-18.15%	177.34%	-88.22%

Panel B Number of Investors Participating in the Private Placement

	1	2~4	5~14	15~30	more than 30
Number of transactions	32	48	73	21	7
(% of placements)	18%	26%	40%	12%	4%
Number of investors	32	131	635	426	233
(% of investors)	20%	9%	44%	29%	16%
Total proceeds(NT millions)	54,454	16,602	18,643	4,828	2,451
(% of sample proceeds)	56%	17%	19%	5%	3%

Our sample contains 204 private placements of equity by 146 public firms between January 2002 and May 2007. Panel A lists the fundamental data of private placement companies. EPS, total assets, debt ratio, total equity, and book value per share are based on the year before private placement. Market value is the average price thirty trading days before the announcement. ROE is net income after taxes divided by average assets. ROA is income after taxes and before interest and depreciation divided by total assets. Percentage issued is the number of shares issued divided by total outstanding shares one year after issuing. Discount A= $(P_o-P_{+1})/P_{+1}$. Discount B= $(P_o-P_{-10})/P_{-10,}$ where P_o is the offer price, P_{+1} is the first day market price, P_{-10} is the average closing price ten days before the announcement. Table B lists the number of investor participating in the private placement. For 23 cases in our sample, the information of private investors are not available, therefore Table B includes 181 private placement cases.

Investor Type and Private Placement Discounts

To clarify whether private placement discounts vary among different types of investors, we assigned the investors of a given placement to one of three categories: "existing insiders", "new insiders" and "outsiders" according to whether they possess board membership before and after the placements. "Existing insiders" are those who were already insiders (directors) before the private placement. "New insiders" refer to individuals who become insiders after investing in the private offering. Finally, investors who own shares but have no control over the firm are termed "outsiders". In this paper, "outsiders" include existing and new outside shareholders who invest in a private placement.

As mentioned earlier, 56% of placements are made by five or more investors (see Table 2). These placements have multiple investors, and the investors may be of different types. For these placements, analyzing the control relationship between the issuer and investor is not straightforward. Therefore, we examine all investors involved in each placement to determine a "dominant" or "the main investor" by adopting the following rules. First, a relationship type is dominant if that type purchases more than 50% of the shares offered in the placement. There are 137 placements with a dominant investor under this

criterion. For the remaining 44 placements, since investors who purchase under 50% of shares are categorized under different types of buyers (the largest and the second largest buyer), it is difficult to definitively determine the main investor's type. We deal with these placements according to the following criteria. If the difference in the purchasing ratio between the largest and the second largest buyer is more than 10%, then the largest buyer is the main investor. There are 14 placements under this criterion. For the placements in which two or more investors have the same purchasing ratio or the difference in their purchasing ratio is less than 10%, we assign the relevant placement to each of the relevant investor categories. There are 30 cases under this criterion.

In short, 151 private placements with a single dominant investor fall into three "pure" categories: "existing insider" (42 placements or 23% of the sample), "new insider" (27 placements or 15% of the sample) and "outsider" (82 placements or 45% of the sample). Note that there are 30 cases with multiple main investors, and these cases are divided into three "mixed" categories: "existing insider and new insider" (2 placements), "existing insider and outsider" (23 placements) and "new insider and outsider" (5 placements). Our definition of the "pure" categories allows us to investigate the variation in private placement discount among different types of investors more accurately. As the samples of the "mixed" categories are negligible, we do not show them in the following empirical results.

Table 3 reveals that the pricing of private placements varies with the type of purchaser. The median discount for "existing insider", "new insider" and "outsider" are around -4.0%, -26%, and -20%, respectively. Generally, new insiders and outsiders enjoy a large discount for private placement, while existing insiders are willing to pay more compared to new insiders and outsiders. The results can be explained by the information asymmetry argument of Hertzel and Smith (1993). They pointed out that outsiders face higher information asymmetry than insiders, and thus they pay less in private placements. Our findings also agree with the entrenchment hypothesis (Barclay, Holderness, and Sheehan (2007)). Under this hypothesis, private equity offers often serve to entrench management through placing shares with passive outside investors at deep discounts. Moreover, our result is consistent with the findings of Median (2006). He pointed out that investors who gain board representation receive a greater discount than other investors, and the larger discount is compensation to investors for participating in the governance process.

Table 3: Private Placement Discount (Premium) by Investor's Type

	Investor's Types							
	All Sample		**Existing Insider (EXT)**		**New Insider (NEW)**		**Outsider (OUT)**	
	Mean	**Median**	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**
discount								
Discount A	-2.8%	-18.9%	6.2%	-4.3%	-9.4%	-23.3%	-6.6%	-22.1%
Discount B	-2.3%	-18.2%	6.5%	-4.6%	-11.6%	-26.0%	-4.4%	-19.3%
Sample	181		42		27		82	
	Difference Test in Mean (Median) of Private Placement Discount							
	(EXT)=(NEW)		**(EXT)=(OUT)**		**(NEW)=(OUT)**		**(EXT)=(NEW)=(OUT)**	
P-value Mean	(0.09)*		(0.20)		(0.46)		(0.36)	
P-value Median	(0.08)*		(0.13)		(0.52)		(0.28)	

Discount A = $(P_o - P_{+1})/P_{+1}$. Discount B = $(P_o - P_{-10})/P_{-10}$, where P_o is the offer price, P_{+1} is the first day market price, P_{-10} is the average closing price ten days before the announcement. "Existing insider" refers to placements in which the main investor was insider before the private placement; "new insider" refers to placements in which the main investor becomes insiders after investing in the private offering. Investors who own shares but have no control over the firm are classified as "outsider". P-value for the difference test in means and medians are using by discount B., **, and *** indicate significant at the 10%, 5%, and 1% level respectively.*

A further question is whether the changes in the control power of the largest *existing* shareholder influences the pricing among different categories of investor. To address this issue, each investor type is

further divided into two groups according to whether the largest *existing* shareholder maintains the leading status or become more powerful after private placements. The results are listed in Table 4. We find that placement discounts sold to new insiders and outsiders are smaller when the largest existing shareholder maintains the leading control status and when they are more powerful following private placement; while the discounts sold to existing insiders are larger in this situation. On the contrary, if the largest shareholder fails to retain the leading position or when they are less powerful after private placements, new insiders and outsiders enjoy a relatively larger discount while existing insiders pay more. A closer examination of the effect of large shareholder's control on private placement pricing is shown in the following empirical analysis.

Table 4: Investor Type, Changes in Control of the Existing Largest Shareholder and Discounts

Panel A: Investor's Types

	Existing insider (EXT)			**New insider (NEW)**			**Outsider (OUT)**		
	Total	**Maintained**	**Transfer**	**Total**	**Maintained**	**Transfer**	**Total**	**Maintained**	**Transfer**
Discount A	-4%	-10%	0%	-23%	-18%	-26%	-22%	-6%	-23%
Discount B	-5%	-11%	-2%	-26%	-16%	-30%	-19%	-10%	-22%
Sample	42	25	17	27	8	19	82	23	59

Panel B: Investor's Types

	Existing insider (EXT)			**New insider (NEW)**			**Outsider (OUT)**		
	Total	$\Delta s1 > 0$	$\Delta s1 < 0$	Total	$\Delta s1 > 0$	$\Delta s1 < 0$	Total	$\Delta s1 > 0$	$\Delta s1 < 0$
Discount A	-4%	-19%	3%	-23%	-14%	-23%	-22%	-5%	-23%
Discount B	-5%	-18%	-3%	-26%	-17%	-26%	-19%	-10%	-21%
Sample	42	19	23	27	4	23	82	14	68

Discount A = $(P_o - P_{+1})/P_{+1}$. Discount B = $(P_o - P_{-10})/P_{-10}$, where P_o is the offer price, P_{+1} is the first day market price, P_{-10} is the average closing price ten days before the announcement. "Existing insider" refers to placements in which the main investor was insider before the private placement. "New insider" refers to placements in which the main investor becomes insiders after investing in the private offering. Investors who own shares but have no control over the firm are classified as "outsider". In Panel A and Panel B, each investor type further divided into two groups according to whether the largest existing shareholder maintains the leading status or become more powerful after private placements. "Maintained" refers to placements in which the largest shareholder maintains a leading position after private placements. "Transfer" refers to placements in which the largest shareholder failed to retain the leading position after private placements. "Δ_s 1>0" refers to placements in which the power index of the largest existing shareholder is increased after private placement. "Δ_s 1<0" refers to placements in which the power index of the largest existing shareholder is decreased after private placement.

Placement Motivation and Private Placement Discounts

Press announcements associated with private placements raise the possibility that these transactions have various motivations for both the issuing firms and the buyers. Varying motivations may have contributed to the different result of private placement discount. Barclay, Holderness and Sheehan (2007) divided the private placements into three types (active, managerial and passive placements) according to the post-issue relationship between the issuer and private placement investors. There are some shortcomings to this research. First, it is unclear how investor motivation is identified when there is more than one type of participating investor. Second, investor motivation could have been better verified with news or reports after as well as *before* the private issues. We collected all newspaper associated with each private placement *before* and *after* the announcement to verify the motivations for both the issuing firms and the buyers. Based on these motivations, placements are further divided into four groups. Basically, if the goal of the investors is to obtain block control in the private placement for strategic alliance or future M&A actions, these placements are considered to be the "aggressive" type.

The purchasers or an officer of the purchaser (when the purchaser is another corporation) in such cases often joins the board of the issuing firm. In some cases the investors were passively invited by the issuing firm for reasons such as technological cooperation or strategic alliance, and these placements were classified as being "invited". In many cases, the issuing firms were in financial distress; therefore, the purchasers were sought by the distressed firm to provide financial support through private placement. The

placements under this criterion were classified as "financial distress". Finally, for some firms with healthy financial performance, the motivation of conducting private placement is raising capital for further investment opportunities. These placements are referred to "financial need". The four categories are mutually exclusive. Since private placements are often the only viable financing choice for firms in financial distress, i.e., non-distressed firms actually have a choice between private and public issues. We expect the influence of motivations to be more relevant in private placement pricing for non-distressed firms.

To analyze whether motivation significantly impacts pricing, we classify placements into four types based on the motivations for both the issuing firms and the buyers. These categories are as follows: "financial distress" (100 placements or 55% of the sample), "aggressive" (22 placements or 12% of the sample), "invited" (13 placements or 7% of the sample) and "financial need" (46 placements or 25% of the sample). Table 5 signals placement motivation significantly influences private placement discount. The "aggressive" placements are made at lower discount (-16%), while "invited" placements and "financial need" placements are made at a larger discount (about -28% and -21%, respectively). The larger discounts seem to compensate the purchasers for their passivity in participating in private placement, or for their financial support for the issuer's further investment.

Table 5: Private Placement Discount (Premium) by Placement Motivation

	Placement Motivations							
	Distress (DIS)		**Aggressive(AGG)**		**Invited (INV)**		**Financial Need (NED)**	
	Mean	**Median**	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**
discount (premium)								
Discount A	5.4%	-12.4%	-7.4%	-16.3%	-30.6%	-35.9%	-10.4%	-21.7%
Discount B	5.8%	-13.0%	-6.4%	-16.0%	-30.1%	-28.2%	-10.2%	-21.4%
Sample	100		22		13		46	
	Difference Test in Mean (Median) of Private Placement Discount							
	(DIS)=(AGG)		(DIS)=(INV)		(DIS)=(NED)		(DIS)=(AGG)=(INV)=(NED)	
P-value Mean	(0.33)		(0.02)**		(0.09)*		(0.05)**	
P-value Median	(0.39)		(0.02)**		(0.25)		(0.10)*	

Discount A = $(P_o - P_{+1})/P_{+1}$. Discount B = $(P_o - P_{-10})/P_{-10}$. All placements are separated into four groups based on the motivation. If the goal of the investors is to obtain block control in the private placement for joint research or future M&A actions, these placements are considered to be the "Aggressive" type. In some cases the investors were passive to be invited by the issuing firm for reasons such as technological cooperation or strategic alliance, and these placements were classified as being "Invited". In many cases, the issuing firms were in financial distressed, therefore, the purchasers were sought by the distressed firm to provide financial support via private placement. The placements under this case were classified as "Financial distress". Finally, some firms have healthy financial performance, their motivation of conducting private placement are raising capital for further investment opportunities. These placements are referred to "Financial need". P-value for the difference test in means and medians are using by discount B., **, and *** indicate significant at the 10%, 5%, and 1% level respectively.*

EMPIRICAL RESULTS AND DISCUSSION

Ownership Structure and Control Power around Private Placement

In our samples, the average percentage issued private placement is about 23%. This section intends to examine whether the block of shares issued leads to significant changes in the ownership structure and control status of the large shareholders. We focus on the changes in ownership deviation taking place around private placements. First, is the ownership structure of the issuing firm more concentrated or dispersed following private placement? We use the difference in the Banzhaf power index (and shareholdings) held by the largest (w1) and the second largest shareholder (w2) as a proxy measure of ownership concentration. A larger difference in power index or ownership between the preliminary two

shareholders suggests the ownership structure is more concentrated in the largest shareholder.
The results in Table 6 show that, on average, ownership becomes more concentrated following private placement. The shareholding and Banzhaf index of the largest shareholder both increased after private placement (12.97% up to 18.08% and 0.21 up to 0.32, respectively). Also, the difference in ownership and power index between the first and second largest shareholders (w1 and w2) increased significantly. The divergence in the preliminary two shareholders' ownership increased from 6.21% to 9.6%.

Table 6: Ownership Structure and Power Indices around Private Placement

	Before Private Placement						**After Private Placement**					
	Ownership (%)			**Banzhaf Index**			**Ownership (%)**			**Banzhaf Index**		
	w1	w2	w1-w2	w1	w2	w1-w2	w1	w2	w1-w2	w1	w2	w1-w2
all sample(n=181)	12.97	6.76	6.21	0.21	0.06	0.15	18.08	8.48	9.60***	0.32	0.06	0.26***
Control maintained (n=63)	17.64	7.14	10.50	0.33	0.05	0.28	17.68	8.31	9.36	0.32	0.06	0.26
Control transfer (n=118)	10.48	6.57	3.91	0.15	0.06	0.09	18.30	8.57	9.73***	0.32	0.07	0.26***

This table reports the change of ownership structure and power index of the issuing firm before and after private placements. w1 and w2 indicate the two largest shareholders, respectively w1- w2 is the difference of the ownership (or Banzhaf index) between the largest and second largest shareholder. "Control maintained" are placements with the largest shareholders maintain a leading position after private placements. "Control transfer" are placements with the largest shareholders failed to keep the leading position after private placements. We also use mean-different test of the hypothesis that the change in difference of ownership (or Banzhaf index) is not different before and after private placement.

Besides, the difference in their power index increased from 0.15 to 0.26, indicating shareholding and control power are more concentrated in the largest shareholder following private placement. Our findings agree with Wruck (1989), who found that the shareholding of the largest shareholders increased from 31% to 37% after private placement.

Table 6 categories the sample into "control maintained" and "control transfer" according to whether the largest existing shareholder preserves his or her leading status after private placement. For "control maintained", the difference in ownership and power index between the first and second largest shareholders shows no clear variation around private offerings, but there is a significantly variation for "control transfer" placements. This indicates that, for "control transfer" placements, ownership and control power are remarkably more concentrated in the new largest shareholder.

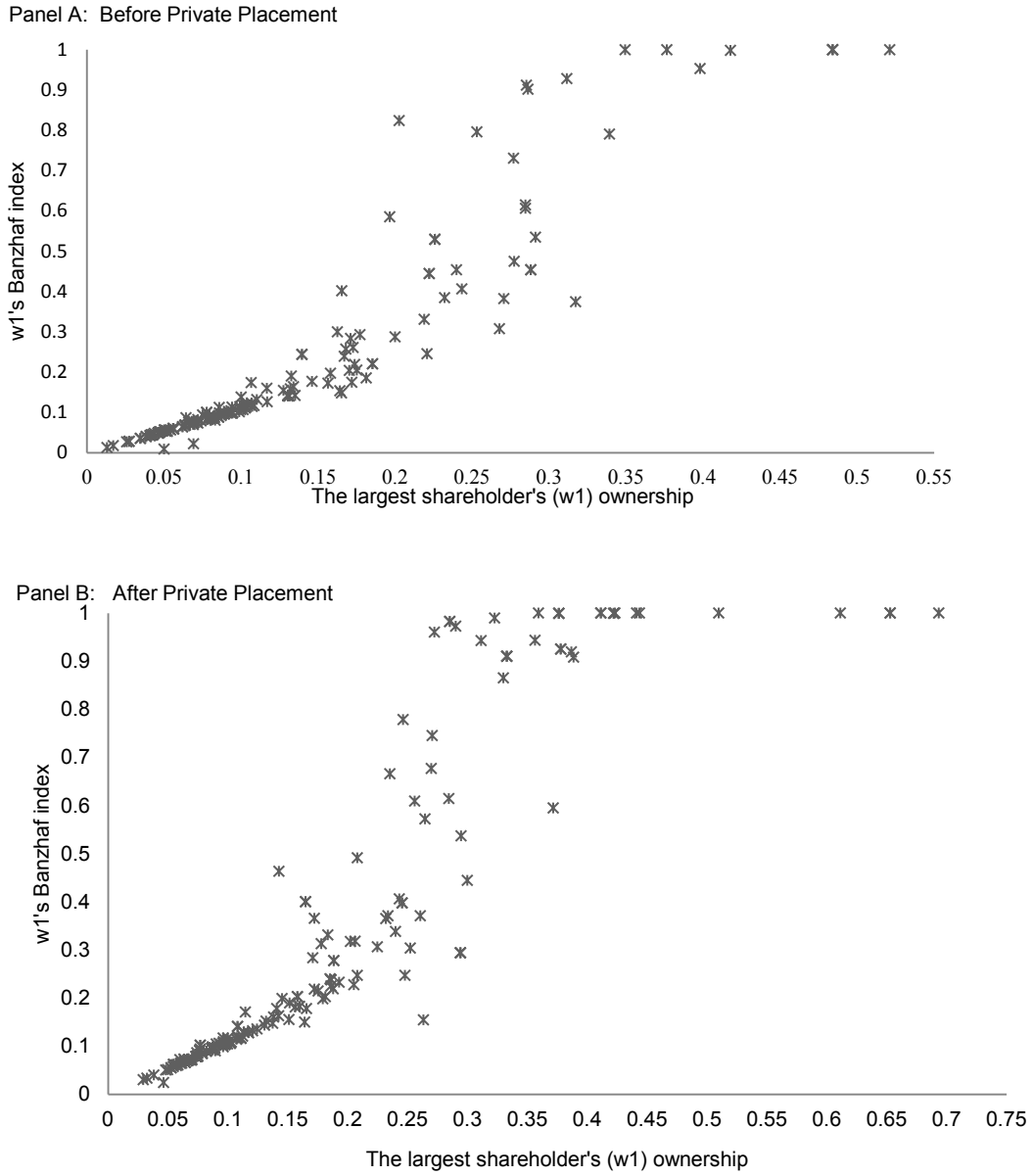
Figure 1 plots the respective power indices for the largest shareholding. It provides a clearly explanation of the largest shareholder's influence over the firm around private placement. The result shows the plot for the power index has a close to simple linear relation when ownership is fewer than 20%; however, it varies widely when ownership is over 20%. The variation is consistent with the view that the power index fully captures the effect of different ownership structures. Panel A and panel B in Figure 1show absolute power can be obtained at 35% ownership before private placement, but it drops to 27% after private placement. Absolute power means that the Banzhaf index of the largest shareholder is close to 1.The results suggest that the percentage ownership required to maintain control decreases after private placement. This reinforces the results of Table 6, in which control power is more concentrated in the largest shareholder following private placement.

The Control Power of the Largest Existing Shareholder around Private Placement

Can the largest *existing* shareholder (S1) maintain his or her influence in the company after private placement? Table 7 lists the changes in ownership and power indices of the largest *existing* shareholder before and after private placement. For all placements, the ownership and power index of the largest *existing* shareholder clearly decreases (from 13% to 10% and from 0.21 to 0.14, respectively). Importantly,

only 35% of the sampled largest shareholders still maintain a leading position after private placement, and in more than 65% of the sample the power of the largest *existing* shareholders declines. The results clearly show a largest shareholder turnover of 65% in the one year following a private placement.

Figure 1: Power Index of Largest Shareholder vs. Shareholding



This figure shows the respective power indices (Banzhaf index) for the largest shareholding before and after private placement. w1 indicates the largest shareholder of the issuing firm.

Further, samples are classified into "control maintained" and "control transfer". For placements with "control maintained", the holdings by the largest existing shareholder averages 18% before the private equity sale, larger than those of "control transfer" (about 10%). Also, the ownership and power index of the largest existing shareholder significantly decline in placements with "control transfer". This indicates that private placements may bring a new large block-holder and consequently control power transferred from the original large shareholder to a new one in private placement offerings, in particular when the largest shareholder's ownership is low.

Table 7: Ownership and Power Indices of the Existing Largest Shareholder (S1)

	Before Private Placement		After Private Placement	
	Ownership (%)	Banzhaf index	Ownership (%)	Banzhaf index
all sample(n=181)	12.95	0.21	9.70***	0.14***
	largest shareholder's ownership ranking after placement		sample	percentage
	1		63	35%
	2		38	21%
	3		10	5%
	>3		70	38%
Control maintained (n=63)	17.64	0.33	17.78	0.32
Control transfer (n=118)	10.50	0.15	5.38***	0.04***

This table lists average ownership and power indices (Banzhaf index) of the existing largest shareholder of 181 private placement firms before and after private offering. "Control maintained" are placements with the largest shareholders maintain a leading position after private placements. "Control transfer" are placements with the largest shareholders failed to keep the leading position after private placements. The largest shareholder's ownership ranking after the placement is shown in this table. We also use mean-different test of the hypothesis that the ownership (or Banzhaf index) of the largest shareholder are not different before and after the sale.

Determinant of Private Placement Discount

The following cross-sectional regression is estimated for examining the relationship between private placement discount and the changes in control right to existing shareholders resulting from the offer.

$$\begin{aligned} Discount_i = {} & \alpha + \beta_1 \cdot \Delta(\text{insider control rights})_i + \beta_2 \cdot \Delta(\text{S1 power index})_i + \beta_3 \cdot \Delta(\text{S1 ownership})_i + \\ & \beta_4 \cdot ((w1 - w2)_{before})_i + \beta_5 \cdot ((w1 - w2)_{after})_i + \beta_6 \cdot (\text{aggressive dummy})_i + \\ & \beta_7 \cdot (\text{invited dummy})_i + \beta_8 \cdot (\text{financial need dummy})_i + \beta_9 \cdot (\text{existing insider dummy})_i + \\ & \beta_{10} \cdot (\text{new insider dummy})_i + \beta_{11} \cdot (\text{outsider dummy})_i + \beta_{12} \cdot (\text{placement characteristics})_i + \\ & \beta_{13} \cdot (\text{firm characteristics})_i + \beta_{14} \cdot (\text{market return}) + \beta_{15} \cdot (\text{industry dummy}) + \varepsilon_i \end{aligned} \quad (1)$$

Discount is negative (positive) if the market price is higher (lower) than the offer price. △(*insider control rights*) denotes the change in the percentage of existing insider board seats before and after the private placement. For example, if the number of existing insider board seats is changed from five to four after private placement, then △(*insider control rights*) is -20%.Control rights can be seen as a broad definition of control in the corporate governance literature. As mentioned above, the power index reflects more in the large shareholder's relative influence over the firm; therefore we use △(*S1 power index*) and △(*S1 ownership*) to represent the change in the power index and ownership of the largest existing shareholder before and after private placement. Ownership structure variables included in the regression. $((w1\text{-}w2)_{before})$ and $((w1\text{-}w2)_{after})$ denote the difference in ownership between the largest and second largest shareholder before and after private placement, respectively. Placement characteristics (e.g., percentage size, number of purchasers; etc.) and firm characteristics (e.g., firm size, ROA, firm age and the debt ratio; etc.) are also included as control variables in the regression of the private placement discount. Furthermore, to capture the influence of varying placement motivations and investor types on pricing, motivation dummy and investor type dummy are also included in the regression.

Market return denotes the cumulative market return included in the control for the possible market effect. *Industry dummy* is included in the regression analysis because it is also an important factor in determination of private placement discount.Table 8 illustrates the empirical results of the regression of private placement discount in terms of the variation in insider control power. The dependent variable is the pricing discount calculated as the difference between the offer price and the average price over the ten trading days before the announcement and is winsorized at 5%.We also use discount calculated as the difference between the offer price and the market price on the first day after the announcement as dependent variables. The results are similar to the results of Table 8, so they are not shown here. The VIF statistics reveal no collinearity among the explanatory variables. The results in Table 8 indicate the coefficients on △(*S1 power index*) and △(*S1 ownership*) are both significantly positive, suggesting there

is a strong, positive association between the increased power (ownership) of the largest *existing* shareholder and private placement discount. This indicates that, when the existing shareholder becomes more powerful, the placements are issued at a higher price. We also find there is no strong relationship between the ownership structure before and after private placement and pricing. The results also suggest that the power index could better reflect the insider's relative influence over the firm because the coefficient of △(*insider control rights*) is insignificant.

Further, we added a motivation dummy and investor type dummy in the regression of Table 8. The motivations of private placement have a greater influence on pricing than investor types. The omitted category is financially distressed placements. Compared to "financially distressed" purchasers, "invited" purchasers pay the least, followed by "financial need" purchasers and then "aggressive" purchasers. The results agree with previous findings in Table 5. Although the investor type dummies are all insignificant, new insiders and outsiders buy at a larger discount for private placement. The sign of the coefficients on percentage issued and number of investors are both negative and significant, meaning as more purchasers participate in the private placement and more shares are issued, the price will decrease. Private placement discount should increase with firm size because larger firms offer potentially larger benefits, both pecuniary and non-pecuniary (Barclay and Holderness (1989)). On the other hand, the costs of being a block-holder also increase with firm size, as larger firms are likely to be monitored more closely by security analysts, government officials, and institutional investors. We measure firm size as the log of total assets. The results in Table 8 show that the effect of firm size on private placement discount is not significant. The size of the debt may affect the size of the private placement discount. Debt can have a negative effect on private benefits by constraining access to free cash flow (Jensen (1986)). In contrast, debt can also increase one's effective control over corporate assets. Table 8 indicates leverage is an insignificant factor. Contrary to the results of previous studies, we find the coefficients of ROA and M/B ratio are all negative and statistically significant, indicating that price discounts are larger for well-performing firms with higher managerial quality. A reasonable explanation for this is, for firms with higher ROA and M/B ratio, their placement motivations may almost belong to "invited" and "financial need", and therefore the discount for these two categories are larger.

Investor Type, Changes in Control of the Largest Existing Shareholder and Pricing

The next question is what conditions prompt the insiders to pay more or less in private placement. Table 4 suggests existing insiders pay less when the largest *existing* shareholder maintains the leading position while they pay more when the largest *existing* shareholder loses the leading position. In this section, we use the logit regression to test the impact of the control status or the changes in power index of the largest *existing* shareholder on pricing. In Table 9, the dependent variable equals one if the discount is larger than the median discount of private placement with the same investor type, and zero otherwise. The reason we use a dummy variable rather than the discount level as the dependent variable is we want to verify whether the discount of each placement is larger or smaller than the median discount of the private placement with the same investor type. Table 9 shows that there is a varied effect of control status and changes in the power index of the largest *existing* shareholder on pricing among different types of investors. In Panel A, the coefficient on *(control maintained dummy*existing insider)* is significantly negative, while the coefficient on *(control maintained dummy*outsider and new insider)* is positive and statistically significant.

Table 8: Determinant of Private Placements Discounts

	(1)		(2)		(3)		(4)	
	B-value	**p-value**	**B-value**	**p-value**	**B-value**	**p-value**	**B-value**	**p-value**
Intercept	0.849	0.11	**1.007***	0.05	**0.929***	0.10	**1.091****	0.04
Control variables								
△insider control rights	0.016	0.93	-0.027	0.88	0.020	0.90	-0.025	0.89
△S1 power index					**0.359****	0.01	**0.359****	0.02
△S1 ownership	**1.060****	0.03	**1.006***	0.05				
Ownership structure								
$(w1\text{-}w2)_{before}$	0.387	0.41	0.402	0.40	0.496	0.31	0.520	0.29
$(w1\text{-}w2)_{after}$	-0.084	0.78	-0.046	0.88	-0.062	0.83	-0.018	0.95
Placement motivations								
Aggressive			-0.099	0.33			-0.094	0.35
Invited			**-0.191***	0.07			**-0.211****	0.04
Financial need			**-0.178****	0.02			**-0.179****	0.02
Investor types								
Existing insider			0.005	0.96			0.005	0.96
New insider			-0.113	0.36			-0.119	0.33
Outsider			-0.041	0.65			-0.040	0.65
Placement characteristics								
Percentage issued	-0.439	0.19	**-0.438***	0.09	**-0.483***	0.08	**-0.478***	0.08
Number of Investor	-0.007	0.13	**-0.007***	0.08	**-0.007***	0.06	**-0.007***	0.10
Firm characteristics								
ln (Asset)	-0.047	0.16	-0.041	0.21	-0.054	0.13	-0.048	0.17
Debt ratio	0.238	0.33	0.098	0.70	0.234	0.34	0.089	0.72
ROA	**-0.954*****	0.00	**-0.812*****	0.01	**-0.981*****	0.01	**-0.827*****	0.01
M/B ratio	**-0.027*****	0.00	**-0.026*****	0.00	**-0.027*****	0.00	**-0.026*****	0.00
Firm age	-0.003	0.49	-0.005	0.34	-0.003	0.62	-0.005	0.42
Market return	0.204	0.86	0.057	0.96	0.136	0.91	0.005	0.88
Industry	Yes		Yes		Yes		Yes	
Adjusted R2	0.10		0.09		0.08		0.09	
Prob(F-statistic)	(0.00)		(0.00)		(0.00)		(0.01)	

*This table presents coefficients of ordinary-least-squares regressions of the private discounts associated with 181 private placements between 2002 and May 2007. The dependent variable is the pricing discount which is calculated as the difference between the offer price and the average price over the ten trading days before the private placement and is winsorized at 5% in either tail. △(insider control rights) is the change in the percentage of existing inside directors before and after private placements, △(S1 power index) is the change in the largest existing shareholder's Banzhaf index before and after private placements. △(S1 ownership) is the change in the largest existing shareholder's ownerships before and after private placements. We added placement motivation dummy and investor type dummy in the regression. The omitted category is financially distressed placements. Percentage issued is the number of shares issued divided by total outstanding shares after issuing. Number of investor refers to the number of investor participating in the private placement. ln(Asset) is the natural of log of market value of asset. Firm age is the number of years from the time of incorporation. Debt ratio, ROA and M/B ratio are obtained before the private placement. (Market return) is the cumulative market return. Industry is a dummy variable to control for the industry effects. The superscripts *, **, and *** indicate that the value is significantly different from zero at the 10%, 5% and 1% level respectively. The p-values are adjusted for heteroskedasticity using the White (1980) method.*

Conversely, the coefficient of *(control transfer dummy* outsider and new insider)* is significantly negative, but the coefficient on *(control transfer dummy* existing insider)* is insignificant. Although the estimated coefficient of *(△s1>0 dummy* outsider and new insider)* is insignificant, the results in Panel B are similar to in Panel A.

We also use the changes in *ownership* of the largest *existing* shareholder as a dummy variable, but since the estimated coefficients are not significant, to save space we do not show them in this paper. This result indicates the largest shareholder's influence on pricing can be reflected using the power index rather than ownership, therefore power index is a better measure for control than ownership. The results in Table 9 reveal that if the existing shareholders maintain their leading control status and become more powerful following private placement, in cases where insiders are the main investors, they will issue private placements at deep discounts to benefit themselves; however, in cases where outsiders/new insiders are

the main investors, outsiders and new insiders will pay more when existing insiders dominate. On the contrary, if existing shareholders fail to retain their leading position and become less powerful after private placement, outsiders and new insiders can buy at lower prices. Thus, the changes in control of the largest *existing* shareholder around private placement can explain the puzzle on private placement pricing being sold to insiders. It worth to note that we identify the existing insider buyer and the largest shareholder before private placement are almost have the same identity. This identification allows us to investigate how the insider buyer can grab a larger discount in private placement more accurately. Our results indicate that insiders promptly self-deal by setting a lower price to benefit themselves only if they become more powerful following private placement, but not when a new power dominates after placement. There is no evidence to support the control premium hypothesis whereby insiders are willing to pay more for increased power over the firm.

Table 9: Investor Type, Changes in Control of the Largest Existing Shareholder and Pricing

	(1)		(2)		(3)		(4)	
	B-value	**p-value**	**B-value**	**p-value**	**B-value**	**p-value**	**B-value**	**p-value**
Intercept	-1.073	0.61	-1.041	0.62	-0.468	0.84	-0.413	0.86
Control variables* investor type								
Control maintained*existing insider	**-0.198***	0.07						
Control maintained*mixed existing insider			-0.001	0.98				
Control maintained *outsider and new insider	**0.798****	0.04	**0.837****	0.04				
Control transfer *existing insider					-0.238	0.69		
Control transfer *mixed existing insider							-0.339	0.46
Control transfer *outsider and new insider					**-0.442***	0.08	**-0.515***	0.09
Placement characteristics								
Percentage issued	**-2.170***	0.09	**-2.100***	0.10	**-1.993***	0.10	-1.956	0.11
Number of Investor	**-0.042***	0.07	**-0.042***	0.07	**-0.043***	0.06	**-0.041***	0.06
Firm characteristics								
ln (Asset)	0.164	0.25	0.156	0.28	0.136	0.39	0.137	0.39
Debt ratio	0.040	0.87	0.205	0.87	0.270	0.80	0.229	0.83
ROA	**-4.008*****	0.01	**-3.992*****	0.00	**-3.573****	0.02	**-3.714*****	0.01
M/B ratio	**-0.084***	0.08	**-0.086***	0.07	**-0.010***	0.05	**-0.088***	0.06
Firm age	-0.014	0.46	-0.014	0.48	-0.012	0.55	-0.012	0.56
Industry	Yes		Yes		Yes		Yes	
χ^2-statistic (p-value)	29.19 (0.003)		29.02 (0.00)		26.93 (0.00)		27.31 (0.00)	
McFadden's R-squared	0.116		0.115		0.107		0.108	
Number of observations	181		181		181		181	

*Panel A Panel A estimates logit models relating the probability of paying more against the largest shareholder's control power and other potential determinants of pricing. The dependent variable equals one if the discount is larger than the median discount of private placement with the same investor type, and zero otherwise. "Control maintained" is a dummy that equals one when the largest shareholder maintains a leading position after private placements, otherwise zero. "Control transfer" is a dummy that equals one when the largest shareholder failed to keep the leading position after private placements. "Existing insider" is a dummy that take a value of one when the main investor was already insider (director) before the private placement. "outsider and new insider" is a dummy that take a value of one when the main investor who own shares but have no control over the firm or when the main investor was become insider after private placement. Because the sample number of "new insider" placements is rare, "outsider" and "new insider" placements are combined in the logit regression. Finally, "mixed existing insider" is also a dummy that take a value of one when the multiple main investors are classified to "existing insider and outsider" or "existing insider and new insider" Percentage issued is the number of shares issued divided by total outstanding shares after issuing. Number of investor refers to the number of investor participating in the private placement. ln(Asset) is the natural of log of market value of asset. Firm age is the number of years from the time of incorporation. Debt ratio, ROA and M/B ratio are obtained before the private placement. Industry is a dummy variable to control for the industry effects. The superscripts *, **, and *** indicate that the value is significantly different from zero at the 10%, 5% and 1% level respectively.*

Table 9: (continued)

	(1)		(2)		(3)		(4)	
	B-value	**p-value**	**B-value**	**p-value**	**B-value**	**p-value**	**B-value**	**p-value**
Intercept	-0.409	0.85	-0.587	0.80	1.824	0.48	1.768	0.49
Control variables* investor type								
ΔS1>0 dummy*existing insider	**-0.645***	0.08						
ΔS1>0 dummy*mixed existing insider			-0.616	0.20				
ΔS1>0 dummy*outsider and new insider	0.315	0.55	0.293	0.58				
ΔS1<0 dummy*existing insider					-0.363	0.52		
ΔS1<0 dummy*mixed existing insider							-0.196	0.68
ΔS1<0 dummy*outsider and new insider					**-0.577***	0.07	**-0.574***	0.09
Placement characteristics								
Percentage issued	**-2.084***	0.08	**-2.094***	0.08	-1.348	0.28	-1.328	0.29
Number of Investor	**-0.039***	0.07	**-0.038***	0.08	**-0.037***	0.10	-0.034	0.16
Firm characteristics								
ln (Asset)	0.108	0.48	0.118	0.45	-0.005	0.97	-0.001	0.99
Debt ratio	0.080	0.94	-0.097	0.92	0.360	0.74	0.303	0.77
ROA	**-2.720****	0.06	**-2.814****	0.06	**-5.660*****	0.00	**-5.672*****	0.00
M/B ratio	-0.050	0.25	-0.050	0.25	**-0.123****	0.04	**-0.119***	0.05
Firm age	-0.006	0.75	-0.006	0.77	-0.054	0.65	-0.054	0.68
Industry	Yes		Yes		Yes		Yes	
χ^2-statistic (p-value)	22.25 (0.03)		22.40 (0.03)		30.56 (0.00)		30.32 (0.00)	
McFadden's R-squared	0.088		0.121		0.130		0.129	
Number of observations	181		181		181		181	

*Panel B Panel B estimates logit models relating the probability of paying more against the largest shareholder's control power and other potential determinants of pricing. The dependent variable equals one if the discount is larger than the median discount of private placement with the same investor type, and zero otherwise. "ΔS1>0 dummy" is a dummy that equals one when the power index of the largest existing shareholder is increased after private placement, and zero otherwise. "ΔS1<0 dummy" is a dummy that equals one when the power index of the largest existing shareholder is decreased after private placement, and zero otherwise. The definition of other variables is the same as Panel A of Table 9.The superscripts *, **, and *** indicate that the value is significantly different from zero at the 10%, 5% and 1% level respectively.*

CONCLUSIONS

Although past studies have observed that the type of investors in private placements significantly influences price discounts, no study has yet been able to identify the conditions determining the prices paid by insiders in private placements. This paper clarifies the debate on prices sold to insiders by considering the variation in control power of the largest shareholders in private placements. Our findings show that changes in the largest *existing* shareholder's power index is the key to explain the price insiders and outsiders pay. Insiders pay less only if they become more controlling, and in which case outsiders and new insiders pay more. That is, self-dealing exists only when existing insiders become more powerful after private placement, but not when a new power dominates after placement. We found no evidence of the control premium hypothesis. Moreover, the motivations of placement have a greater influence on private placement pricing than the main type of participating investors.

The placements with aggressive investors are issued at lower discounts, while placements with passive or financial support investors are issued at larger discounts.The result highlights the fact private placement does not always increase the power of current insiders, and the new block-holders may reshape the ownership structure of the issuing firm, and therefore, the largest *existing* shareholder's real control power. On average, the ownership and power index of the largest *existing* shareholder decreases after private placements. The finding suggests in private placement the *existing* large shareholder is willing to give up some control power, consistent with the argument of Zingales (1995) and Bebchuk (1999) that insiders

wanting to entrench control rights would choose public listings. We also found that the deviation in ownership and control power between the two largest shareholders (w1 and w2) increases, indicating the issuing firm's ownership structure becomes more concentrated following private placements. The results of this paper provide in-depth analysis of the relationship between pricing and insider's control variations in private placement, and lead to a better understanding of the bargaining power among participants in private placement. The implication of our empirical results is that private placements are likely to be use a self-dealing vehicle when existing insiders remain dominant control, but not so if there is change in control power. It would be interesting to observe the long-run dynamics of the largest shareholder's influence following private placements in future studies.

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AN ANALYSIS OF THE DEGREE OF DIVERSIFICATION AND FIRM PERFORMANCE

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ABSTRACT

A firm's diversification decision is likely to be a response of two interacting effects, one is the agent problem and the other is the economies of scale. Whether diversification causes a discount or a premium depends on the interaction of the two effects. This paper re-evaluates the effect of diversification on firm performance by examining firms with different degrees of diversification. We found the evidence that the diversification premium gets smaller if a firm engages in more than three industries.

JEL: G30, G34, L22, L25

KEYWORDS: Tobin's Q, Firm performance, Diversification

INTRODUCTION

A key strategy issue facing corporate management relates to the degree of diversification that their firm should achieve. Thus, the relationship between diversification and firm performance has inspired a large literature in many fields, including Industrial Organization, Corporate Finance and Strategic Management. However, after several decades of research, the literature has not reached a decisive conclusion whether diversification causes a premium or a discount.

Lang and Stulz (1994) showed that Tobin's q and firm diversification are negatively related. Firms that choose to diversify are poor performers relative to specialized firms. Berger and Ofek (1995) also found that diversified firms trade at a discount relative to specialized firms. Conversely, recent research shows that the diversification discount disappears when we control for the self selection problem. Campa and Kedia (2002) found that firm characteristics, which make firms diversify, might also cause them to be discounted. Villalonga (2004) estimated the value effect of diversification by matching diversifying and single-segment firms on their propensity score and found that diversification does not destroy firm value. In the same direction, Graham, Lemmon and Wolf (2002) pointed out that segments acquired by diversifying firms already traded at a discount before the acquisition, thus refuting the post acquisition negative relationship between diversification and firm performance.

Despite being a central topic in the corporate finance literature, we have not reached a consensus on the effect of diversification on firm performance. Thus, the issue whether diversification improves or worsens firm performance is still worthy of further research.

A diversification discount or premium is a balance of the costs and the benefits of diversification. If the costs of diversification outweigh the benefits, there may exist a diversification discount or vice versa. The gains generally can rise from: (1) managerial economies of scale; (2) efficient resource allocation in internal capital market; (3) firms' current resource may be exploited in other industries. On the other hand, the costs may arise from: (1) inefficient resource allocation in internal capital market; (2) opportunities for managers to use firm resource for their own benefits; (3) difficulty of motivating divisional managers.

The main purpose of this paper is to re-evaluate the effect of diversification on firm performance by examining firms with different degrees of diversification. Intuitively, diversification may intensify agency problem between corporate insiders and small shareholders. On the other hand, diversification may boost firm value due to the economies of scale. Whether diversification causes a discount or a premium depends on the interaction of the two effects. By focusing on the degrees of diversification, we may offer new insight into this diversification debate.

The remainder of the paper is organized as follows. The next section reviews the literature on firm performance. We then introduce the methodology and the measurement of firm performance. Next, we describe the data and provide some summary statistics. Finally, we provide the empirical results and conclude the paper.

LITERATURE REVIEW

The diversification discount has been the subject of an active debate in corporate finance during the past few years. There is a substantial literature that compares diversified firms to specialized firms, but empirical evidence is to date is far from conclusive.

Lang and Stulz (1994) showed a negative relationship between firm performance and diversification by using different diversification measures. They found that highly diversified firms have significantly lower average and median q ratios than specialized firms so firms that choose to diversify are poor performer relative to specialized firms.

Along this line, Berger and Ofek (1995) used segment-level data to study the effects of diversification on firm value by estimating the value of a diversified firm's segments as if they were operated as separate firms. They also found that diversification reduces firm value by 13% to 15% over the 1986-91 sample periods for firms of all sizes.

Other research, including Servaes (1996) and Lin and Servaes (1996) confirm the existence of this diversification discount and this discount seems to be robust to different time periods and different countries. On the other hand, several recent studies show that the discount disappears when sample selection bias is controlled for.

Campa and Kedia (2002) argued that diversifying and nondiversifying firms differ systematically in many firm characteristics. They use a panel data and instrumental variables to control for the endogeneity of the diversification decision and found that the diversification discount disappears and even turns into a premium when selection bias is corrected for.

Villalonga (2004) employed a new comprehensive database to examine whether diversified firms in the United Stateds trade at a discount relative to specialized firms. The new data is used to construct business units that are more consistently and objectively constructed than segments; the use of the new data reveals that diversified firms actually trade at a large and statistically significant premium relative to specialized firms in the same industry.

Graham, Lemmon and Wolf (2002) contended that the division of diversified firms systematically differs from the stand-alone firms. Failure to account for this difference would lead to incorrect inferences regarding the value of a diversified firm. They analyze several hundred firms that expand via acquisition or increase their number of business segments. They show that units that are combined into firms through merger or acquisition are priced at significant discounts prior to merger. Due to the discounted unit added to existing firms the combined firms are traded at a discount.

METHODOLOGY

To investigate the dominating effect of the benefits and the costs, we will model the relationship between firm performance and diversification as

$$Y_{it} = \alpha + X_{it}\beta + \delta_1 I_{\{seg=1\}} + \delta_2 I_{\{seg=2\}} + \delta_3 I_{\{seg=3\}} + c_i + e_{it}, \quad (1)$$

where Y_{it} is firm performance, which is measured by Tobin's q. $I_{\{.\}}$ is an index function. Seg denotes the number of divisions a firm owns. c_i denotes unobserved heterogeneity, and X_{it} are some control variables.

To estimate the parameters δ_1 , δ_2 and δ_3, we may evaluate the dominating effect on firm performance. Therefore, we might cast some new insights into the firm's diversification issue. Intuitively, when a firm starts to diversify, the benefits should be greater than the costs. Up to certain degree, larger firms would be much more difficult to monitor, which increases the costs. When the costs outweigh the benefits, a diversification premium would become a diversification discount. By dividing firms into four groups, we may detect the critical point that the costs start to outweigh the benefits.

In this paper, we use Tobin's q as a measure of firm performance. Tobin's q is calculated as the sum of the market value of common equity plus the book value of preferred shares plus the book value of total debt divided by the book value of total asset. As is pointed by Lang and Stulz (1994), q is designed to measure the present value of future cash flows divided by the replacement costs of tangible asset. One advantage of using Tobin's q is that there is no theoretical reason to adjust for risk or leverage to compare firms.

THE DATA

The sample consists of all firms with annual data reported on the COMPUSTAT Industry Segment database and Industry Annual from 1996 to 2002. All financial firms (6000-6999) are excluded since financial firms are difficult to value with the methodology being used due to their special characteristics. We also exclude firms whose sales are below $20 million to prevent distortions caused by small firms. Table 1 shows some summary statistics, where we divide all the firms into four groups: (1) Firms operating in two industries; (2) Firms operating in three industries; (3) Firms operating in more than three industries. As we can observe from this table, large firms are more likely to engage in multiple industries, which is an important characteristic of diversified firms. Roughly speaking, more firms are engaging in multiple industries. In this table, we report the observations instead of the number of firms in different groups since diversified firms may become specialized firms for this period or vice versa.

Table 1: Summary Statistics

Seg	Obs	Ave_asset	Ave_sales	Med_asset	Med_sales	Std_asset	Std_sales
1	11126	3404	1510	332	233	27818	5477
2	5492	6543	3358	671	548	34157	11935
3	4669	9332	5468	1493	1047	42961	15991
4	4345	32358	15256	4246	2944	105211	33622

This table shows the average, median and standard deviations of assets and sales for firms with different degrees of diversification. The data were collected from COMPUTAT. The sample comprises 12,006 firm-years from 3070 firms during 1996-2002. Seg denotes Segment SIC Code #1 (Source: SEGSICB data set), which is the number of industries a firm is operating on. Obs are the number of observations. Ave_asset, Ave_sales are the average of total asset and sales. Med_asset and Med_sales are the medians of assets and sales. Std_asset, Std_sales are the standard deviations of assets and sales.

RESULTS

In table 2, we provide estimates of OLS regressions. In specification 1, we use segment dummies as specified in equation (2), log of assets, book leverage ratio, EBIT/sales, R&D/Sales and invest/Sales as our independent variables. In specification 2, we include squared log of assets as an additional regressor. In specification 3, we include year dummies as additional regressors.

As one can see from table 2, the coefficients on δ_1, δ_2 and δ_3 are all significant and negative. In other words, the diversification discount remains significant, regardless of the number of segments a firm is operating on. As noted above, a diversification discount or premium is a balance of the costs and the benefits of diversification. These results are consistent with Lang and Stulz (1994)'s finding of a negative relation between firm performance and diversification. It should be also noted that R-squared is relatively small for all specifications.

Table 2: Pooled OLS Estimation Results

Independent Variables	**Specification 1**	**Specification 2**	**Specification 3**
δ_1	-0.345(0.069)**	-0.343(0.069)**	-0.420(0.082)**
δ_2	-0.500(0.077)**	-0.506(0.077)**	-0.579(0.091)**
δ_3	-0.748(0.094)**	-0.796(0.093)**	-0.836(0.107)**
log of assets	-0.024(0.191)	-0.164(0.064)**	-0.022(0.020)
book leverage ratio	-1.022(2.716)	-1.803(2.961)	-0.967(2.711)
EBIT/Sales	0.899(0.259)**	0.911(0.263)**	0.817(0.244)**
R&D/Sales	1.552(0.340)**	1.569(0.343)**	1.495(0.329)**
invest/Sales	0.146(0.171)	0.165(0.171)	0.108(0.168)
log of assets squared	No	0.010(0 .004)	No
Constant	2.262(0.086)**	2.690(0.219)**	2.195(0.097)**
Year dummies	No	No	Yes
R-squared	0.027	0.028	0.030

This table shows the simple OLS regression estimates of the equation: $Y_{it} = \alpha + X_{it}\beta + \delta_1 I_{\{seg=1\}} + \delta_2 I_{\{seg=2\}} + \delta_3 I_{\{seg=3\}} + e_{it}$.
*The dependent variable is Tobin's q. For the first equation, we does not include squared log of assets. For the second specification, we include one extra regressor: squared log of assets. For the last specification, year dummies are included to control for year effect. Robust standard errors in parentheses , * * significant at 5%; * significant at 10%*

Table 3 shows the fixed effect estimation result, which vary substantially from Table 2. As we can observe from this table, for specification 1, the estimators of δ_1, δ_2 and δ_3 are positive and only the estimator of δ_3 is insignificant. For specification 2, we can observe the same sign and the same significance levels of the coefficients. In contrast, for specification 3, the estimators of δ_1, δ_2 are positive but insignificant. This new results provide new empirical evidence on diversification premium. However, the estimator of δ_3 is negative and significant.

In comparison with the results in Table 2, the R squared values in fixed effect models are much larger than the ones in simple OLS regression. This provides new evidence that fixed effect models can

explain variability in a data set much better than OLS models. In some sense, this result provides evidence of a positive relationship between firm performance and diversification.

For the fixed effect model, we control for firm fixed effect. We also run a random effect model and obtain similar results as in table 2. In addition, we ran Hausman specification test. The null hypothesis of the Hausman test is that the random effect model is consistent. The alternative hypothesis is that both random effect and fixed effect models are consistent. Based on the Hausman test, all null hypotheses are rejected at 5% significance levels. The testing results also show the estimators of the OLS models as in described in table 2 are inconsistent. Therefore, our empirical evidence shows a positive relationship between firm performance and diversification.

Table 3: Fixed Effect Estimation Results

Independent Variables	**Specification 1**	**Specification 2**	**Specification 3**
δ_1	0.192(0.109)*	0.191(0.109)**	0.084(0.112)
δ_2	0.230(0.128)*	0.229(0.128)**	0.093(0.131)
δ_3	0.196(0.161)	0.194(0.161)	-0.836(0.107)**
log of assets	-0.697(0.057)**	-0.722(0.193)**	-0.010(0.166)
book leverage ratio	-0.393(2.334)	0.361(2.344)	0.243(2.348)
EBIT/Sales	0.837 (0.167)**	0.838(0.167)**	0.800(0.169)**
R&D/Sales	0.040(0.199)	-0.039(0.199)	-0.035(0.200)
invest/Sales	0.593(0.223)**	0.594(0.223)**	0.587 (0.227)**
log of assets squared	No	0.002(0 .015)	No
Constant	6.308(0.356)**	6.376(0.603)**	6.520(0.382)**
Year dummies	No	No	Yes
R-squared	0.365	0.365	0.368

*See the note for table 2. In this table, we control for firm fixed effect and run the same regressions to. Robust standard error in parentheses , * * significant at 5%; * significant at 10%.*

CONCLUSION

In this paper, we studied firms with different diversifying degrees and found that diversified firms operate on a premium. Firms choose the extent of their operations and decide whether to operate in a single industry or diversifying into multiple industries. A firm's diversification decision is likely to be a response of two interacting effects, one is the agent problem and the other is the economies of scale. By using an annual dataset comprised of 12,006 firm-years from 3070 firms during 1996-2002, we employed a panel data model and found a positive relationship between firm performance and diversification. Further research is needed to use other datasets to check the robustness of our results.

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IMPACT OF DIVESTITURE ACTIVITIES ON CORPORATE PERFORMANCE: EVIDENCE FROM LISTED FIRMS IN TAIWAN

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ABSTRACT

This study examines how divesture affects the performance of listed companies in Taiwan. Divestiture describes firms selling their assets, production lines, subsidiaries or other segments for either cash or securities. This study focuses on two types of divestiture activities: sell-offs and equity carve-outs. Specifically, this work employs a control group design to examine 266 sell-off and equity carve-out announcements between 1995 and 2004, and measures the short-term abnormal stock returns and long-term (5 years) operating performance using financial ratios. The analytical results show significant positive stock abnormal returns associated with divestiture announcements for listed companies in Taiwan. Furthermore, firms generally experienced enhanced performance after undertaking divestiture activities.

JEL: G34, G14

KEYWORDS: Divestiture, Sell-offs, Equity carve-outs, Event study, Taiwan

INTRODUCTION

Firms can adopt numerous growth strategies, one of which is divestiture. One recent trend has seen diversified firms exhibit a diversification discount compared to stand-alone firms. Rajan, Servaes and Zingales (2000) think that with increased diversity in resources and opportunities, resources flow towards the least efficient division, resulting in less efficient investment and lower firm value. Studies show that firms that engage in divestitures and increase their focus achieve improved operating performance and stock returns (Comment & Jarrell, 1995; John & Ofek, 1995). Dittmar and Shivdasani (2003) indicate that the efficiency of segment investment increases considerably following divestitures.

Other empirical studies on divestitures focus on two areas, namely the impacts of divestiture activities on stockholder wealth and firm operating performance, respectively. Numerous studies have investigated the effect on shareholder wealth of firm announcements to voluntarily divest part of their operations, and all have shown that divestiture announcements positively affect parent firm stock returns (Mulherin & Boone, 2000; Dittmar & Shivdasani, 2003; Datta, Iskandar-Datta, & Raman, 2003; Veld & Veld-Merkoulova, 2004). Regarding the impact of divestiture activities on the operating performance, Haynes, Thompson and Wright (2002) indicate that divestment significantly, positively and substantially enhances firm profitability. Hanson and Song (2003) found that divestitures improve firm operating performance, apparently by removing negative synergies. Most scholars support the perspective that divestitures improve operating performance (Hulburt, Miles & Woolridge, 2002; Dittmar & Shivdasani, 2003).

Few empirical studies have examined firm divestitures in Taiwan or other emerging developing economies. Therefore, it is worth exploring whether or not Taiwanese firms engaging in divestitures improve their performance. Regarding shareholder wealth effects, most previous studies focused on the wealth effect of merger/investment announcements and payment for acquisitions. Previous studies of the wealth effect associated with firm divestiture announcements have been insufficient. This study

explores whether firm divestitures significantly affect stock returns.

This study examines a sample of 266 sell-offs and equity carve-outs between 1995 and 2004 and measures short-term performance based on stock returns and long-term (5 years) operating performance based on financial ratios. The evidence reveals significant positive cumulative abnormal returns associated with firm divesting announcements and that divestiture activities can improve their operating performance and enhance firm value. The rest part of this paper is organized as follows. Section 2 reviews the related studies. Section 3 depicts the sample. Section 4 reports the empirical results. Section 5 concludes.

LITERATURE REVIEW

John and Ofek (1995) documented a significant improvement in the performance of the seller firm's remaining assets in the two years following the divestment. Lang, Poulsen and Stulz (1995) suggested that firms benefit from announcing successful sales because a successful sale means that the firm received enough money to make the sale worthwhile.

Cho and Cohen (1997) found that firms experience improved operating performance following divesting. Haynes, Thompson and Wright (2002) indicated that divestment significantly, positively and substantially improves firm profitability. Dittmar and Shivdasani (2003) showed that changes in divisional investment are associated with decreased diversification discount. Furthermore, Hanson and Song (2003) documented that divestitures improve firm operating performance, and this improvement possibly results from the removal of negative synergies. This study infers that firms engaging in divestitures may decrease the resource misallocation and reallocate these resources to valuable segments. Besides, divestment can relax financial constraints for the remaining segments of firms. This can make them have more opportunities to invest on net present value projects and gain performance improvement.

Rosenfeld (1984) presented that sell-off announcements tend to have a positive influence on the stock prices of the divesting firms. Jain (1985) showed that both sellers and buyers earn significant positive excess returns form sell-off transactions. Hite, Owers and Rogers (1987) demonstrated that firms partially divesting their assets exhibit significant cumulative abnormal returns (CARs) during the announcement period. Moreover, Dittmar and Shivdasani (2003) found that divestiture announcements are associated with significant positively returns. Specifically they found all CARs to be statistically significant at the 1% level. Datta, Iskandar-Datta and Raman (2003) document that both stockholders and bondholders of divesting firms gain considerably from divestiture transactions.

This study infers that firms can dispose of assets that have no operational efficiency after divesting and use cash from divestitures to undertake more investment that is efficient. In addition, it will be helpful for investors to classify and evaluate for firms after divesting. Therefore, divestiture announcements should result in a positive effect on the shareholder wealth.

DATA AND METHODOLOGY

This study focuses on the divestiture announcements of listed companies in Taiwan during 1995-2004. The dates of divesting events are obtained from the "Public Announcements" of the Taiwan Securities and Futures Institute. Financial data of listed companies, including the market value of stock, leverage ratio, the percentage of managerial ownership and so on, are all obtained from the Taiwan Economic Journal (TEJ). To increase the sample reliability, this study employed the following sample selection criteria: The sample comprises listed companies in Taiwan that reported divestitures to the "Taiwan Securities & Futures Institute" or in professional commercial newspapers. We examined the trading data for the 180 trading days before and 30 trading days after the announcement date. Firms with multiple divesting

events during the event period were excluded from the sample. The divesting firms had to disclosure divestiture trading data. The control group sample comprised firms with similar size and in the same industry as the divesting firms. In addition, they did not engage in divestitures during the same year as the divesting firms.

Performance Variables

This study uses the average value of each performance variable from five years following divestment minus that from five years before divestment to perform difference analysis for exploring whether divestitures enhance firm performance. Additionally, this study employs the average value of each performance variable from the five years following divestment to examine the influence of the characteristics of divesting firms and divestiture activities on firm performance. The performance variables are Excess value (EV), Return on assets (ROA) and Cash flow to current debts (CFD).

Excess value compares firm value with its imputed value based on the assumption that each of its segments operates as a single-segment firm. Excess value is defined as the log of the ratio of firm value to imputed value. The method used to calculate excess value is as follows:

$$EV=\ln\left(\frac{V}{I(V)}\right) \quad (1)$$

$$I(V)=\sum_{i=1}^{n} AI_i \times \left[Ind_i \left(\frac{V}{AI}\right)_{mf} \right] \quad (2)$$

EV is firm excess value; V is firm total capital (market value of equity plus book value of debt); I(V) is imputed value of the sum of firm segments as stand-alone firms; AI_i : the value of the accounting item (sales) used in the valuation multiple for segment i; $Ind_i\left(\frac{V}{AI}\right)_{mf}$ is the multiple of total capital in relation to an accounting item (sales) for the median single-segment firm in the industry of segment i; n is total number of segments in the firm.

Shareholder Wealth Effect

Regarding event window selection, most scholars use the day before and after the announcement date to perform event study for the announcement effect (McNichols and Dravid, 1990; Banker and Datar, 1992; Denis and Sarin, 1994). This study adopts event study to examine the influence of firm divestiture announcement on abnormal stock returns, and uses the market model to calculate the average abnormal returns (AR), standardized average abnormal returns (SAR), cumulative average abnormal returns (CAR) and standardized cumulative average abnormal returns (CSAR) for sample firms during the event periods.

Owing to the price limitations affecting the domestic stock market in Taiwan, stock prices react inefficiently compared to foreign markets, and announcement news is sometimes leaked. The total observation period of firm divestiture announcements in this study was from t=-150 to t=+30. Table 1 lists the operating definitions of the variables related to shareholder wealth effect.

Table 1：The Operating Definitions of the Variables Related to Shareholder Wealth Effect

Variables	Definition	
Individual stock daily returns	Not ex-dividend (ex-right) day: [(closing price for reference day]/closing price for the previous day])-1] ×100% Ex-dividend (ex-right) day: [(closing price for reference day× (1+N+S) +C)/ (closing price for the previous day] +F×S)-1] ×100%, N: stock dividend ratios (entitlement ratios); S: seasoned equity offering dividend ratios; C: cash dividends; F: individual share underwriting price for seasoned equity offering.	
Market portfolio daily returns	[(issuing volume weighed stock price index for the reference day]/ issuing volume weighed stock price index for the previous day])-1] ×100%	
	Abnormal returns for the individual sample stock $\hat{R}_{j,t} = \hat{\alpha}_j + \hat{\beta}_j R_{mt}$ $AR_{j,t} = R_{j,t} - \hat{R}_{jt}$ t=-30~+30	$\hat{R}_{j,t}$ =expected returns of stock j of the sample firm on day t during the event period; $R_{j,t}$: abnormal returns of sample firm j on day t during the event period; $R_{j,t}$: actual returns of sample firm j on day t during the event period; R_{mt}: actual returns of market portfolios on day t during the event period;$\hat{\alpha}_j$: the regression analysis intercept term of sample firm stock j and the daily returns for the market portfolio;$\hat{\beta}_j$: the regression analysis coefficient of stock j of the sample firm and daily returns of the market portfolio.
	Average abnormal returns for the whole sample	$AR_t = \frac{\sum_{j=1}^{n} AR_{j,t}}{n}$ t=-30~+30. Where, AR_t: average abnormal returns for the whole sample on day t during the event period; n: number for firm divestiture announcement
	Cumulative abnormal returns for the individual sample	$CAR_j = \sum_{t=b}^{e} AR_{j,t}$ CAR_j: cumulative abnormal returns of sample firm stock j during the event window; b: the beginning date of the event window; e: the end date of the event window.
	Cumulative average abnormal returns for the whole sample	$CAR = \sum_{t=b}^{e} AR_t$
	Standardized stock abnormal returns for the individual sample	$SAR_{jt} = \frac{AR_{jt}}{S_j\sqrt{1+\frac{1}{120}+\frac{(R_{mt}-\bar{R}_m)^2}{\sum_{r=-31}^{150}(R_{mr}-\bar{R}_m)^2}}}$ t=-30~+30 SAR_{jt}: The standardized abnormal returns of sample firm j on day t during the event period; $\bar{R}_m$: average market portfolio returns during the estimation period r=-31~ -150; S_j: standard deviation of the abnormal returns of sample firm j during the estimation period r=-31~ -150. The calculation method is: $S_j^2 = \frac{1}{119}\sum_{r=-31}^{-150}(AR_{jr}-\overline{AR}_j)^2$ $\overline{AR}_j = \frac{1}{120}\sum_{t=-31}^{-150} AR_{jr}$
	Standardized average abnormal returns of the whole sample	$SAR_t = \frac{\sum_{j=1}^{n} SAR_{jt}}{n}$ t=-30~+30 SAR_t : The standardized average abnormal returns for all of the sample firms on day t during the event period.
	Cumulative standardized abnormal returns for individual samples	$CSAR_j = \sum_{t=b}^{e} SAR_{jt}$ $CSAR_j$ the cumulative standardized abnormal returns of sample firm j during the event window.
	Cumulative standardized abnormal returns for the whole sample	$CSAR = \sum_{t=b}^{e} SAR_t$ CSAR: the cumulative standardized average abnormal returns for the whole sample during the event window.

RESULTS

Descriptive Statistics

The sample consists of 266 cases, which are 157 for sell-offs and 109 for equity carve-outs. The largest numbers of firms undertaking sell-offs was shown in 1998 with 32 cases, representing 20.38% of the sample. The years with the second largest numbers of sell-offs were 1999 and 2000, which each saw sell offs involving 14.65% of the total sample. Clearly, sell-off activities involving listed firms have recently become increasingly frequent. Most of these cases have involved the textile industry with 25 cases, or 15.92% of the sample. This may be because the textile industry is a sunset industry. Textile industry firms thus must dispose of their unprofitable assets for the same of survival. Construction and electronics are the next most common industries for sell-off activity, representing 12.10% and 10.83% of all sample firms respectively.

On the other hand, for equity carve-outs the year of most intense activity was 2000, with 19 cases, representing 17.43% of the sample. The next busiest years for equity carve-outs were 2002, 2001, and 1998, with 17, 17 and 14 cases, representing 15.60%, 12.84% and 12.84% of the sample, respectively. Clearly, there has recently been frequent equity care-out activity involving listed firms, mirroring the situation for sell-off activity. Most cases of equity carve-out involved the electronics industry, with 43 cases, representing 39.45% of the sample. This phenomenon may occur because the electronics industry is more diversified than other industries, possibly resulting in a larger diversification discount. Electronics industry firms may sell shares in unprofitable subsidiaries more frequently than firms in other industries to reduce the diversification discount. The remaining firms involved in equity carve-outs are spread across other industries.

Difference Tests for Firm Performance before and after Divestiture

This study uses Kolmogorov-Smirnov One-sample Test to determine whether the sample exhibits a normal distribution. According to the K-S-Z value test results shown in Table 2, if the values achieve significance, the variables are not normally distributed. Therefore, this study uses the Wilcoxon symbol test, a nonparametric method, for performance difference testing. If the values do not achieve significance, the variables are normally distributed. This study thus uses the Paired-Sample T Test to conduct performance difference testing.

Table 2: The Mean, Standard Deviation and Normal Distribution Test of Performance Variables of Divesting Sample Group and Control Group

A: Sell-off Sample			**N=157**
Measure Variables	**Mean**	**Std.**	**K-S Z value**
Average EV of sample group (5 years after-5 years before)	1.7362	1.162	1.141
Average EV of control group(5 years after-5 years before)	0.4450	0.5642	1.152
Average ROA of sample group (5 years after-5 years before) (%)	3.4223	18.7618	4.135***
Average ROA of control group (5 years after-5 years before) (%)	3.178	17.0463	3.996***
Average CFD of sample group (5 years after-5 years before) (%)	11.7421	27.3208	0.789
Average CFD of control group (5 years after-5 years before) (%)	11.5847	27.246	0.788
B: Equity Carve-out Sample			**N=109**
Measure Variables	**Mean**	**Std.**	**K-S Z value**
Average EV of sample group (5 years after-5 years before)	0.2838	0.4008	2.554***
Average EV of control group (5 years after-5 years before)	0.1564	0.3091	3.202***
Average ROA of sample group (5 years after-5 years before) (%)	1.7252	4.6643	1.446**
Average ROA of control group (5 years after-5 years before) (%)	1.4899	4.5962	1.529**
Average CFD of sample group (5 years after-5 years before) (%)	12.804	23.824	1.607**
Average CFD of control group (5 years after-5 years before) (%)	12.5246	23.7613	1.637***

Panel A shows the results for the Sell-off Sample. Panel B shows the results for the Equity Carve-out Sample. *EV is Excess value; ROA is Return on assets; CFD is Cash flow to current debts.* ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.

Performance Difference Test of Divesting Firms before and after Divesting

The results reveal that the performance measure variables, including average excess value, return on assets, and cash flow to current debts (5 years after-5 years before), differ significantly between before and after firm divestitures, as listed in Table 3. For both the sell-off and equity-carve firms, the three performance variables all increase significantly following divesting. However, whether firms involved in divestitures exhibit enhanced performance remains uncertain, since these firms may be influenced by market trends, industry developments or environmental changes. Therefore, this study further compares the performance differences between the sample and control firms.

Table 3: The Performance Mean Difference Test of Divesting Sample Group 5 Years after and 5 Years before Divesting

A: Sell-off Sample			
Measure Variables	**N**	**Z value**	**P value**
Excess value	157	+10.868	0.000***
Return on assets	157	+6.477	0.000***
Cash flow to current debts	157	+5.197	0.000***
B: Equity Carve-out Sample			
Measure Variables	**N**	**Z value**	**P value**
Excess value	109	+9.062	0.000***
Return on assets	109	+4.627	0.000***
Cash flow to current debts	109	+6.704	0.000***

*Panel A shows the results for the Sell-off Sample. Panel B shows the results for the Equity Carve-out Sample. ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.*

Performance Difference Test of the Divesting and Control Groups Before and After Divesting

Table 4 indicates that the sample firms exhibit a significant increase in excess value (EV) after divesting compared to the control group. Divesting sample firms also exhibit significantly increased return on assets compared to the control group, a phenomenon measured by the profitability of the total assets of the sample firm increasing after divesting. Furthermore, divesting sample firms also display significantly increased cash flow to current debts compared to the control group. Consequently, the ability of the cash flow of sample firms to repay current debts is stronger after divesting. Generally, divestitures can enhance firm performance. These results mirror those of Cho and Cohen (1997), Hulburt, Miles, and Woolridge (2002), Hanson and Song (2003), and Dittmar and Shivdasani (2003).

Table 4: The Performance Difference Test of Divesting Sample Group and Control Group before and after Divesting

A: Sell-off Sample			
Measure Variables	**N**	**Z value or T Value**	**P value**
Excess value (Sample Group - Control Group)	157	T=+14.935	0.000***
Return on assets (Sample Group - Control Group)	157	Z=+9.704	0.000***
Cash flow to current debts (Sample Group - Control Group)	157	T=+9.479	0.000***
B: Equity Carve-out Sample			
Measure Variables	**N**	**Z value or T Value**	**P value**
Excess value (Sample Group - Control Group)	109	Z=+9.062	0.000***
Return on assets (Sample Group - Control Group)	109	Z=+8.387	0.000***
Cash flow to current debts (Sample Group - Control Group)	109	Z=+8.926	0.000***

*Panel A shows the results for the Sell-off Sample. Panel B shows the results for the Equity Carve-out Sample. ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.*

Abnormal Returns Analysis for Firm Divestiture Announcements

For both the sell-off and equity carve-out samples, the highest standardized average abnormal returns are the 0.2328% and 0.2576% of divesting announcement dates respectively. Generally, for standardized average abnormal returns, a positive reaction to firm divestment announcement date occurs on and before and announcement day. However, negative standardized average abnormal returns occur following the announcement date. These negative returns gradually increase to become positive standardized average abnormal returns. These analytical results demonstrate that news of divestment announcements may be leaked, causing the market to react in advance of the event. Additionally, the announcement day exhibits an excessive reaction, while negative abnormal returns follow the announcement day. These results resemble those of Klein, Rosenfeld, and Beranek (1991), Kaiser and Stouraitis (1995), Mulherin and Boone (2000), and Dittmar and Shivdasani (2003).

To analyze the impact of firm divestiture announcements on the firm shareholder wealth, we can understand the sight and short-term announcement effect of firm divestiture announcement before and after the announcement day by the cumulative average abnormal returns (CARs) and the standardized cumulative average abnormal returns (CSARs) of event windows before and after firm divestiture announcement. Table 5 presents the results.

Regarding sell-off sample, the standardized cumulative average abnormal return (CSAR) of event window (-1, +1) is 0.2430%, achieving 0.05 significant level in Table 5. This can further prove the announcement event of divestitures have positive CSARs during the announcement day. The CSAR of event window (-10, -2) is 0.3532% with 0.1 significant level. It implies that the news has the revealing condition in advance and leads to market reaction in advance. However, the CSAR of event window (+2, +10) after announcement day is –0.5409% with 0.01 significant level, which means the market has over-reacted and then justified. Following the CSARs return to positive value on event window (-30, +30).

Table 5: The Average Cumulative Abnormal Returns of the Event Windows of the Divesting Firms

	Panel A: Sell-off Sample (N=157)				**Panel B: Equity Carve-out Sample (N=109)**			
Event windows	**CAR**	t **(CARt)**	**CSAR**	t **(CSARt)**	**CAR**	t **(CARt)**	**CSAR**	t **(CSARt)**
(-1 ,+ 1)	0.2418	0.0579	0.2430	1.9677**	0.7359	0.1953	0.2897	1.9280**
(-5 , +5)	0.4367	0.0546	0.2326	0.8980	0.8449	0.1171	0.3525	1.4981*
(-10 ,- 2)	1.2319	0.1714	0.3532	1.6951*	0.1951	0.0390	0.0304	0.0119
(+2 , +10)	-1.2079	-0.1740	-0.5409	-2.3437**	-0.5156	-0.0790	-0.2606	-0.9396
(-30 , +30)	0.1034	0.0033	0.0927	0.1349	0.7471	0.0254	0.1981	0.0886

*Panel A shows the results for the Sell-off Sample. Panel B shows the results for the Equity Carve-out Sample. CAR is the cumulative average abnormal return . CSAR is the standardized cumulative average abnormal return. ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.*

Regarding equity carve-out sample, the standardized cumulative average abnormal returns (CSAR) of event window (-1, +1) and (-5, +5) are 0.2897% and 0.3525%, achieving 0.05 and 0.1 significant levels in Table 5. Because the announcement event news of divestitures revealed in advance excessively, the CSAR presents positive value on event window (-10, -2). However, the CSARs is positive value on event window (-30, +30) insignificantly. These empirical results are similar to the results of Klein, Rosenfeld, and Beranek (1991), Kaiser and Stouraitis (1995), Mulherin and Boone (2000), Dittmar and Shivdasani (2003).

CONCLUSIONS

This study employs a control group design to examine 266 sell-off and equity carve-out announcements between 1995 and 2004, and measures the short-term abnormal stock returns and long-term (5 years) operating performance using financial ratios. Evidence shows significant positive cumulative abnormal returns on the divestiture announcement date. Firm involvement in divestitures thus represents good news for investors. Consequently, positive cumulative abnormal returns are associated with firm divestiture announcements, together with significant positive market reactions on the announcement day. The news frequently leaked, resulting in an advance market reaction. The evidence shows that divestiture activities can often improve firm operating performance and enhance firm value. Due to the difficulties of data collection and empirical process in this study, further researches direct the larger samples, focus extent change of firms after divesting and adopting multiple measurement of variables.

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BIOGRAPHY

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AN ESTIMATION OF THE IMPACT OF GEAR AND NEPAD ON SOUTH AFRICA'S DISAGGREGATED IMPORT DEMAND FUNCTION WITH NIGERIA

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This paper estimates South Africa's disaggregated import demand function with Nigeria from 1992 to 2010 utilizing the bounds testing approach to cointegration and the unrestricted error-correction model. We further estimate South Africa's short-run and long-run import elasticities. Our results indicate a long run cointegrated relationship among the variables. However, not all the long-run elasticities display theoretically expected signs; neither are they all significant. While consumption and exports affect imports positively, investment affects it negatively. Real foreign reserves and volatility yield expected signs, but contrary to theoretical expectations, relative price is positive and highly elastic. In the short run almost all the expected elasticity coefficient signs are met and they are all statistically significant. Our study further discloses that South Africa's commitment to increasing intra-African trade through its GEAR and NEPAD policies applies negatively to Nigeria, contrary to our hypothesis. We argue that appropriate public policy at the regional level is necessary to effectively increase trade with Nigeria, given South Africa's reliance on oil imports for which Nigeria is its largest supplier.

JEL: F14, F31

KEYWORDS: South Africa, Nigeria, disaggregated import demand, cointegration, GEAR, NEPAD.

INTRODUCTION

South Africa, Africa's economic giant, is lauded as one of the more growth-dynamic emerging economies in the global economy. It is characterized as a middle power in international trade with a significant trade and growth impact on surrounding economies. As the economy aspires to increase its economic footprint on the African continent, it is imperative to study its import demand function with African countries. So far, however, such research is sparse at best, with estimates of only a few African countries' import demand functions. This study seeks to fill this void in the literature. Our objective is to investigate South Africa's disaggregated import demand function and its associated long run and short run dynamics with Nigeria from 1992 to 2009. Further, we evaluate the success of its Growth, Employment and Redistribution (GEAR) and the New Partnership for Africa's Development (NEPAD) policies intended to increase intra-African trade, in this case, with Nigeria To our knowledge, this study is the only one of its kind to date. This import demand function is estimated using the bounds testing approach to cointegration and the error-correction model. We proceed in the next section with a brief history of South Africa, after which we review the literature on import demand functions. Thereafter we specify our model and variables and explain the data used for estimation. We then explain and discuss the empirical results, and the final section concludes the paper with suggestions for future studies.

Brief History of South Africa

South Africa, like most other developing countries, suffers from serious economic problems associated with a dependence on imports of capital and intermediate goods, declining exports, increased imports from the west, high unemployment rates, falling foreign reserves, and balance of payments constraints (Department of Trade and Industry, 2011; Saayman, 2010; Ngandu, 2008, 2009; Truett & Truett, 2003).

These problems are primarily a result of the rigidities imposed by the apartheid state (Thompson, 2000; Truett & Truett, 2003; Liu and Saal, 2001).

The apartheid era spanned the period 1948-1994, and the mineral-rich economy thrived at first. However, by the 1970's the economy began to stagnate mostly because of inefficiencies resulting from the distorted allocation of its resources to service its social structures of accumulation (Truett & Truett, 2003; Edwards, 2001) which benefitted one race group at the expense of the other race groups. In this racialized epoch, South Africa perpetuated a conflictual political relationship with most of its African neighbors and these inevitably stymied intra-African trade relations. At the same time, to counter international sanctions against the country, the apartheid government encouraged import substitution industries (ISI), high import tariffs, and subsidies for export promoting industries (Ngandu, 2009; Kaempfer & Ross, 2004; Liu and Saal, 2001). These measures reinforced its economic stagnation (Thompson, 2000) by creating further economic rigidities. After apartheid ended the new government began to recreate an open economy (Department of Trade and Industry, 2011; World Bank, 2010; Truett & Truett, 2003; Edwards, 2001).

It executed a series of strategic trade liberalization policies, among them, promoting privatization, loosening exchange controls, reducing tariffs and export subsidies, and encouraging intra-African trade (Saayman, 2010; Kabundi, 2009; Lesufi, 2004; Streak, 2004; Tsheola, 2002). In 1996, it implemented the Growth, Employment and Redistribution policy (GEAR) aimed at increasing its trade posture in the global economy (Department of Finance - South Africa, 1996; Streak, 2004). GEAR was reinforced in 2001 by the adoption of the New Partnership for Africa's Development, NEPAD, which embodied an alliance of key African leaders on the continent endorsed by world institutions such as the World Bank, International Monetary Fund, the World Trade Organization, and world leaders (NEPAD, 2001). NEPAD represented a quest to integrate African markets into the global economy to advance the welfare and development of the whole continent, and South Africa seemed primed to take the leadership role (Mbeki, 2001).

Table 1: Major Sources of South African Imports, 2010

Region/Country	Value of Imports (Millions of Rands)	Share of Total Imports (%)
Asia	260,023	44.5
Europe	199,273	34.1
Americas	69,839	12.0
Africa	43,931	7.5
Pacific	11,124	1.9
China	84,102	14.4
Germany	66,784	11.4
United States	42,105	7.2
Japan	30,996	5.3
Saudi Arabia	23,718	4.1
Iran	23,003	3.9
United Kingdom	22,152	3.8
India	20,749	3.5
France	17,281	3.0
Nigeria	**16,083**	**2.7**

Note: This table shows the major sources of imports by continent and country, to South Africa. Data is taken from the Department of Trade and Industry, Republic of South Africa (2011).

To encourage the principle of African development through trade, South Africa had to increase its imports from African countries while strengthening its export base. The openness to imports was reflected in the gradual decline of the price ratio of exports to imports, from 1.02 in 1996 to 0.89 in 2009 (South African Reserve Bank, 2009). Its imports grew rapidly at a rate of 8.6% between 1995 and 2008. However, as can be seen in Table 1, imports from African countries barely amounted to 7.5% of imports in 2010. Only one African country, Nigeria, its largest African trading partner, ranks as a top 10 importing country. South Africa's largest import component is oil (Table 2), and Nigeria with 99.5% of its imports in the form oil, is its top oil supplier in the world. Whereas South Africa's trade balance with the African continent

overall is positive, it has a negative balance with Nigeria. (Department of Trade and Industry, 2011). Given the dominance of Nigeria in South Africa's imports, it is reasonable to estimate its import demand function with Nigeria. The outcome of this estimation would inform policy makers of the most reasonable and appropriate policies to enact in its trade policy in general, and in particular, with Nigeria and its surrounding neighbors. The objective of the current study then, is to estimate South Africa's disaggregated demand function with Nigeria from 1992 to 2010.

Table 2: Major South African Imports, 2010

HS	Product	Value of Imports (Millions of Rands)	Share of Total Imports (%)
27	**Mineral Fuels,Mineral Oils….**	**114,796**	**19.6%**
84	Nuclear Reactors,Boilers,Machinery And Mechanical	86,192	14.7%
85	Electrical Machinery And Equipment & Parts	62,577	10.7%
87	Vehicles(Excluding Railway Or Rolling- Stock)	51,279	8.8%
98	Special Classification Provisions (Vehicles' Parts)	37,938	6.5%
90	Optical Photographic,Cinematographic,Measuring,	15,139	2.6%
38	Plastics And Articles Thereof	15,118	2.6%
30	Pharmaceutical Products	15,071	2.6%
29	Organic Chemicals	10,581	1.8%
38	Miscellaneous Chemical Products	8,795	1.5%
40	Rubber And Articles Thereof	8,721	1.5%

Note: This table shows the major import products to South Africa. Data is taken from the Department of Trade and Industry, Republic of South Africa (2011).

LITERATURE REVIEW

Globalization has forced analysts to comprehend the significance of imports in studying a country's macroeconomic performance for economic growth and stability. Since imports react more rapidly than exports to trade policies, estimates of import demand functions have implications for macroeconomic policy. Given this, numerous studies have estimated the import demand functions of countries on all continents. Earlier studies, focusing on developed countries, used ordinary least squares (OLS) as a method to estimate a country's import demand function (Thursby, 1988; Gafar, 1995; Giovanneti, 1989). For example, Giovanneti (1989) showed that consumption, investments, and exports significantly affected Italy's import demand. Gafar (1995), in estimating the demand for imports of Jamaica, Guyana, and Trinidad using OLS, found that income elasticity was positive and price elasticity was negative. However, researchers have questioned these results because the time series data used in such OLS estimates are stationary (Thursby, 1989). Because macroeconomic time series are typically non-stationary, OLS results are unreliable because of serious spurious regression problems (Modeste, 2011).

To overcome false results, a surge of newer studies utilizing cointegration analysis to estimate the import demand function emerged in the last two decades. Chen (2008) for example, tackled Taiwan's import demand function using the bounds test of Pesaran et al. (2001). Results confirmed the existence of a stable long-run relationship between import demand and its determinants, real GDP, and relative prices. In estimating long run elasticities, the author finds an insignificant relationship between import demand and relative prices, and significant elasticity between import demand and GDP. However, short run income responsiveness is considerably greater than its long-run counterpart. Shareef and Tran (2007) examined Australia's aggregate import demand function from 1959 to 2006, using three different models including the Bounds test, the Engle-Granger's residual-based test, and the Johansen and Juselius test. All these models reinforce the conclusion that cointegration exists between imports and real GDP and relative prices. In the long run, the price elasticity is close to unity, while income elasticity is greater than 1. Narayan and Narayan (2005) approximated a disaggregated import demand model for Fiji for the period 1970 to 2000. They found that in the long- and short-runs, consumption, investment, and exports have an inelastic and positive impact on import demand, while relative price is negatively inelastic. Dutta and Ahmad (2004), utilizing the Johansan and Juselius model for the years 1971-1995, and including India's

import liberalization policies as a dummy variable, found a cointegrated relationship between imports and its determinants. In the long run imports have a greater sensitivity to price changes, but in the short run adjustment process, real GDP drives import demand.

Very few efforts have been made to estimate aggregate import demand functions for Sub-Saharan African countries. Among them, Thaver and Ekanayake (2010) employed cointegration analysis to understand South Africa's aggregate import demand function. Their results reinforced other findings that imports depend positively on income and negatively on relative prices. They revealed that apartheid negatively impacted imports in the short run, but not in the long run. On the other hand, international sanctions affected imports positively in the short run and negatively in the long run. Akinlo (2008) employed a translog cost function to examine the substitution relations among capital, labor, and imports in Nigeria. Results demonstrate that domestic capital served as a substitute for both labor and imports. Razafimahefa and Hamori (2005), compared the aggregate import demand function of Madagascar with Mauritius from 1960-2000, and estimated a higher long-run income elasticity in Madagascar than Mauritius. At the same time, their long-run relative price elasticities were almost equal and highly elastic, demonstrating that Madagascar was more import dependent than Mauritius. Gumede (2000) studied the import demand function for South Africa from 1972-1997. His results indicate a long-run significant income elasticity of import demand, but short-run elasticities are insignificant.

The objective of the current study is to estimate South Africa's disaggregated import demand function with a specific African country, Nigeria. In addition to the traditional independent variables, our model includes foreign reserves and volatility as these variables have been shown to significantly influence import demand. In addition, we capture the impact of two policies, namely GEAR and NEPAD, on imports. This study is the first of its kind.

METHOD, MODEL SPECIFICATION, AND DATA SOURCES

In estimating South Africa's disaggregated import demand function with Nigeria we utilize the single-equation technique, which is appropriate given that its economic size and emerging status renders it a price taker in international markets. Its long-run disaggregated import demand function may therefore be specified as:

$$\ln M_t = \beta_0 + \beta_1 \ln RP_t + \beta_2 \ln FR_t + \beta_3 \ln VOL_t + \beta_4 \ln CG_t + \beta_5 \ln INV + \beta_6 \ln EXP_t + \beta_7 D_{1t} + \varepsilon_t \quad (1)$$

The symbols in Equation (1), ln, M_t, t, RP_t,FR_t, VOL_t, CG_t INV_t, EXP_t, and ε_t denote respectively, the natural logarithm, the real import volume, time, the relative price of imports, real foreign reserves, exchange rate volatility, the sum of real government and private consumption expenditures, real investment, real exports, and the white noise. D_{1t} is a dummy variable representing South Africa's commitment (1996-2010) through GEAR and NEPAD to intra-African trade ; and ε_t is the error term.

In Equation (1), RP_t is computed as the ratio of import price to domestic price as measured by each country's CPI. Concomitant with economic theory, we expect β_1 to be negative. While FR_t does not appear in the traditional import demand function, it is an important determinant of imports for developing countries, so we include it in our model as more recent studies have done, for example Hoque and Yusop (2010). Since higher real foreign reserves tend to encourage imports, we expect that $\beta_2 > 0$. To convert CG_t, INV_t, and EXP_t into real terms, we divide each by South Africa's GDP deflator (2005 = 100). Economic theory suggests that each of these components of income and expenditure is a major determinant of a country's imports and under the assumption of imperfect substitution theory, each has a positive impact on import demand. Thus we expect that the coefficients β_4, β_5, and β_6 will be positive. The expected signs of β_1, β_2, β_4, β_5, and β_6 are borne out in empirical results by numerous studies, among them, Thaver and Ekanayake (2010), Hoque and Yusop (2010), Akinlo (2008), Narayan and Narayan

(2005), Razafimahefa and Hamori (2005), Tang (2002, 2004), and Senhadji (1998). D_1 is defined to take the value 0 for years 1992 to 1996 and 1 otherwise. We hypothesize that the sign of β_7 will be positive.

VOL_t is a measure of exchange rate volatility and following Bredin, Fountas, and Murphy (2003), is measured as:

$$VOL_t = \left[\frac{1}{m} \sum_{i=1}^{m} (\ln RER_{t+i-1} - \ln RER_{t+i-2})^2 \right]^{1/2} \tag{2}$$

where RER_t signifies the real exchange rate, and $m = 4$ is the order of the moving average. Since the effects of VOL_t on imports have been found to be empirically and theoretically ambiguous (Bredin, et al. 2003), β_3 could be either positive or negative.

We employ the Bounds test model developed by Pesaran, et al. (2001) for our cointegration analysis because of three advantages over other models. First, it can be applied whether the regressors are purely I(0), purely I(1), or mutually cointegrated. Second, it avoids the need to ascertain the order of integration of the underlying regressors prior to testing the existence of a level relationship between two variables. Third, this method is robust for small and finite samples (Tang, 2002). In estimating the long-run model outlined by Equation (1), the model will distinguish the short-run effects from the model's long-run dynamics. For this purpose, Equation (1) must be specified in an error-correction model (ECM) format following Pesaran, et al. (2001), as has been used in many recent studies, including Hoque and Yusop (2010), Hye (2008), Narayan and Narayan (2005), Razafimahefa and Hamori (2005), Tang (2004), and Thaver and Ekanayake (2010). Using the bounds testing approach to cointegration analysis, we rewrite Equation (1) in an ECM format in Equation (3) below.

$$\begin{aligned} \Delta \ln M_t = {} & \alpha_0 + \sum_{i=1}^{n} \beta_i \Delta \ln M_{t-i} + \sum_{i=0}^{n} \delta_i \Delta \ln RP_{t-i} + \sum_{i=0}^{n} \eta_i \Delta \ln FR_{t-i} + \sum_{i=0}^{n} \gamma_i \Delta \ln VOL_{t-i} \\ & + \sum_{i=0}^{n} \psi_i \Delta \ln CG_{t-i} + \sum_{i=0}^{n} \vartheta_i \Delta \ln INV_{t-i} + \sum_{i=0}^{n} \xi_i \Delta \ln EXP_{t-i} + \alpha_1 D_{1t} \\ & + \lambda_1 \ln M_{t-1} + \lambda_2 \ln RP_{t-1} + \lambda_3 \ln FR_{t-1} + \lambda_4 \ln VOL_{t-1} \\ & + \lambda_5 \ln CG_{t-1} + \lambda_6 \ln INV_{t-1} + \lambda_7 \ln EXP_{t-1} + \omega_t \end{aligned} \tag{3}$$

All variables in equation (2) have been defined previously, except for the first difference operator, which is Δ. Equation (3) undergoes two procedural steps, the first employing the Wald test for the lagged level variables to inquire into the joint significance of the no cointegration hypothesis H_0: $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = \lambda_7 = 0$ against an alternative hypothesis of cointegration H_a: $\lambda_1 \neq 0$, $\lambda_2 \neq 0$, $\lambda_3 \neq 0$, $\lambda_4 \neq 0$, $\lambda_5 \neq 0$, $\lambda_6 \neq 0$, and $\lambda_7 \neq 0$. Pesaran, et al. (2001) provides two sets of critical values for a given significance level with and without a time trend. One assumes that the variables are I(0), and the other assumes that the variables are I(1). If the computed F-value exceeds the upper critical bounds value, H_0 is rejected signaling cointegration among the variables, whereas if the computed F-value falls below the critical bounds value, we fail to reject H_0. If the computed F-statistic falls within the bounds, the model renders inconclusive results. Once establishing a cointegrated relationship, the next step involves estimating the long-run coefficients model and their corresponding short-run dynamics, or ECM. The lagged error correction term (ECM_{t-1}) is important for the cointegrated system as it allows for adjustment back to long run equilibrium after a deviation from rest in the previous period. Since we use quarterly data, the maximum number of lags equals 4.

Equation (3) indicates that real imports are influenced and explained by its past values. From the estimation of ECMs, the long-run elasticities are the negative of the coefficient of one lagged explanatory variable divided by the coefficient of one lagged dependent variable. Thus for example, the long-run relative price and foreign reserves elasticity are (λ_2 / λ_1) and (λ_3 / λ_1) respectively. The short-run effects are captured by the coefficients of the first-differenced variables in Equation (2).

To estimate our model, quarterly data from January 1992 to December 2009 are used. The data series on nominal imports, the import price index, real GDP, foreign exchange reserves, and the domestic price index are taken from the International Monetary Fund's *International Financial Statistics Yearbook (2011)*. Nominal imports in *Rands* are deflated by South Africa's import price index (2005 = 100) to obtain the real import variable. To convert CG_t, INV_t, and EXP_t into real terms, we divide each by South Africa's GDP deflator (2005 = 100). The relative price of imports series is constructed as the ratio of the Nigeria's to South Africa's consumer price index, CPI (2005=100). To obtain the real foreign reserves series, we deflate the nominal foreign exchange reserves series by the GDP deflator.

EMPIRICAL RESULTS

Cointegration among Variables

Table 3 presents the Bounds test results of cointegration between imports and its independent variables. The computed *F*-statistic of 8.926 is higher than Pesaran et al.'s (2001) upper bound critical value of 4.43 at the 1 percent level, confirming that the null hypothesis of no cointegration cannot be accepted, and a unique cointegration relationship between real imports and its determinants exists in our model. That is, import demand is a function of relative prices, foreign reserves, exchange rate volatility, private and public consumption, investment, and exports. This result allows us to move to our next procedural step, namely, to estimate the associated long- and short-run elasticities.

Table 3: *F*- test Results for Cointegration of the Disaggregated Import Demand Model

Critical value bounds of the F-statistic: intercept and no trend						
	10 percent level		**5 percent level**		**1 percent level**	
k	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
6	2.12	3.23	2.45	3.61	3.15	4.43
Calculated F-statistic:						
$F_M(M \mid FR, RP, VOL, CG, INV, EXP)$			8.926***			

*Note: This table shows the results of the ARDL bounds testing for cointegration. The Critical values are taken from Pesaran, Shin, and Smith (2001), Table CI(iii) Case III, p. 300). k is the number of regressors. *** indicates the statistical significance at the 1 percent level.*

Long-Run and Short-Run Elasticities

Having established a long-run cointegrated relationship between import demand and its determinants, we now estimate the long- and short-run elasticities, the results of which we present in Tables 4 & 5. In Table 4, $\bar{R}^2$ is relatively high, indicating that the regressors reliably explain the long-run elasticities in the import demand function for South Africa's trade with Nigeria. However, not all long-run estimated elasticities exhibit the theoretically expected signs; neither are they all significant. The disaggregated expenditure variables are all elastic, and even though consumption (3.357) and export expenditures (1.766) are positive, they are not significant. While investment (-3.15) is significant at the 10% level, it negatively affects imports – for every 1% rise in investment, imports decrease by 3.15%, indicating a strengthening of South Africa's domestic investment climate. Real foreign reserves (0.025) and volatility (0.142) both yield expected signs but are highly inelastic and not significant in the long run.

Table 4: Long-run Elasticities for South Africa's Import Function with Nigeria: 1992-2010

Dependent variable: LnM_t		
Explanatory Variables	Coefficient	t-statistic
Constant	-36.315	-1.589
ln FRt	0.025	0.072
ln RPt	3.315	3.380***
ln VOLt	0.142	1.2248
ln CGt	3.357	1.239
ln INVt	-3.145	-2.361*
ln EXPt	1.766	1.576
D_1t	1.136	-1.4064
Adjusted R-squared (R^2)	0.654	

Note: This table shows the long-run elasticities of the estimated import demand function for South Africa.
**** and * indicate statistical significance at the 1% and 10% level, respectively.*

Relative prices, contrary to theoretical expectations, is directly related to import demand and is highly elastic (3.315), indicating that a 1% rise in relative prices correlates with a 3.3% increase import demand. This contradicts the results of several other studies, among them, Hoque and Yusop (2010), Thaver and Ekanayake (2010), Akinlo (2008), Tang (2002), Matsubayashi and Hamori (2003), and Senhadji (1998). However, because South Africa is highly dependent on oil imports, when relative prices increase, it will respond more elastically to its demand from Nigeria rather than other oil producing countries because of its more favorable trade balance with Nigeria relative to other countries. Congruent with this assertion, imports from Iran fell from a rank of 6 in 2009 to 10 in 2011, while Nigeria improved in rank from 10 to 8 (Department of Trade and Industry, 2011; Thaver and Ekanayake, 2010). Clearly, as other studies have pointed out, political movements and stability affect the import demand function for a specific country.

We present the estimated short-run elasticities in Table 5. In this case, unlike the long-run elasticities, most of the expected coefficient signs are met, and they are statistically significant. Consumption (-0.116) in the short run is negative, very inelastic, and significant compared with the long run. A 1% increase in exports (-1.913) will decrease import demand by 1.91%. Investment (2.608) positively affects imports so a 10% rise in investments yields an increase in imports of 26.1%. Real foreign reserves (0.765) is inelastic, but interestingly, relative price is highly elastic (-8.425), and statistically significant at the 1% level. Table 5 further reveals that the coefficient for D_1 is statistically significant at the 5% level so that in the short run, South Africa's commitment to increased intra-African trade significantly impacted its import demand function with Nigeria, but in an inverse manner.

This may be perplexing, but it is possible that rather than increasing trade with African countries, South Africa merely redirected trade from some African countries to others. Part of this redirection may also be due to its negative trade balance with Nigeria, despite its positive trade balance with African countries as a whole (Department of Trade and Industry, 2011). The error correction term, ECM_{t-1}, gauges the rate at which import demand adjusts to short-run deviations of its regressors before returning to its long run equilibrium level. In accord with theoretical expectations, the error-correction term of our short-run model is statistically significant at the 1% level with the expected negative sign. The coefficient for ECM_{t-1} is -0.586 indicating that once the model in Equation (3) is shocked by changes in one of the import demand determinants, convergence back to equilibrium is above average with 59% of the adjustment occurring in the first year. This may be due to several forces, among them, inertia and high transactions and adjustment costs, given that 99.5% of South Africa's imports from Nigeria is in the form of oil.

Table 5: Error-Correction Representation for the Selected ARDL Model

Dependent variable: $\Delta \ln M_t$		
Explanatory Variables	Coefficient	*t*-statistic
Constant	0.000	0.000
$\Delta \ln M_{t-2}$	0.214	2.660*
$\Delta \ln FR_{t-1}$	0.765	3.700***
$\Delta \ln VOL_t$	-0.214	-2.698***
$\Delta \ln RP_{t-2}$	-8.425	-5.473***
$\Delta \ln CG_{t-1}$	-0.116	-2.615**
$\Delta \ln INV_{t-1}$	2.608	3.226***
$\Delta \ln EXP_{t-2}$	-1.913	-2.414**
D_{1t}	-0.665	-2.504**
ECM_{t-1}	-0.586	-8.394***
Diagnostics		
R^2	0.754	
$\overline{R}^2$	0.693	
Durbin Watson Test	2.135	p-value: 0.598
Breusch-Godfrey Test	0.806	p-value: 0.527
Jarque Bera Test	3.768	p-value: 0.152

Note: This table shows the results of the short-run partial elasticities of the error-correction model.
**** and ** indicate statistical significance at the 1% and 5% level, respectively.*

None of the diagnostic tests in Table 5 is statistically significant, suggesting no evidence of autocorrelation in the disturbance of the error term. The model passes the Jarque-Bera normality tests indicating that the errors are normally distributed and the Durbin-Watson test for autocorrelation in the error term. Finally, the adjusted R^2 of 0.69 indicates that 69 per cent of the variation in import demand is explained by the variables in the model. Hence, based on these statistical properties, it is reasonable to say that the model is well behaved.

CONCLUSIONS, LIMITATIONS, AND SUGGESTIONS FOR FUTURE RESEARCH

In this paper, we estimated South Africa's disaggregated import demand function with Nigeria during 1992-2010 using the Bounds testing approach to cointegration. Our results suggest that a unique cointegration relationship between imports, relative prices, foreign reserves, exchange rate volatility, consumption, investment, and exports, exist. However, not all the long-run elasticities display theoretically expected signs; neither are they all significant. The disaggregated expenditure variables consumption and exports are positive, while investment negatively affects imports. Real foreign reserves and volatility yield expected signs, but relative prices, contrary to theoretical expectations, is directly related to import demand and is highly elastic. In the short run almost all the expected elasticity coefficient signs are met and they are all statistically significant.

Our study further discloses, contrary to our hypothesis, that South Africa's commitment to increasing intra-African trade through its GEAR and NEPAD policies applies inversely to Nigeria. This may be due to other neighboring oil producing countries such as Angola emerging on the trading scene. It may also represent South Africa's preoccupation with the west in enhancing its own trade position in the global economy. In our model none of the diagnostic tests is statistically significant, suggesting no evidence of autocorrelation in the disturbance of the error term. Further, the adjusted R^2 is high enough in both the short run and the long run, so we may conclude that variation in import demand is explained sufficiently by our variables in the model, and it is well behaved.

To our knowledge, this study is the first attempt of its kind by scholars to estimate post-apartheid South Africa's import demand function with Nigeria, let alone the rest of the African continent. The study is also consistent with other studies that demonstrate the superiority of a model that disaggregates GDP components, because not all its components are equally weighted in the import demand function. However, because of the long run lack of significance of most of the regressors, we tested an aggregate import demand model for the same period. The resulting diagnostic test results suggested that the

aggregate model was not specified well. Similarly, the Wald test for cointegration revealed no cointegration between imports and its determinants. Therefore, even though our results in this model contradict expected signs based on theory and empirical results of other countries, we believe it is a valuable study and offer suggestions for further research that could overcome the limitations of the present model. Future studies, rather than using relative price as measured in this model, could use the crude oil price index, given that South Africa's imports from Nigeria is mostly in the form of crude oil. This may allow for better results overall. Also, since so few studies on import demand functions of African countries exist, it would be promising to estimate such functions for other African countries. In these studies, estimating the effect of GEAR and NEPAD policies on import demand with specific countries will inform policy makers of South Africa's successes and challenges in meeting its goals of African development and integration into the world economy.

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INTEREST RATE REFORMS AND FINANCIAL DEEPENING IN NIGERIA

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ABSTRACT

This main objective of the paper is to examine the effect of interest rate reforms on financial deepening in Nigeria. The methodology adopted for the study includes cointegration and vector error correction models (VECM) to determine the long and short run dynamics of the model. The paper examines time series data from 1973 to 2009. The results indicate that there exists a long run relationship between financial deepening and interest rates. We also find that interest rate reform has a positive and significant effect on financial deepening in Nigeria. The results here suggest that policy makers enact measures that positively influence financial development, economic growth, liquidity reserve ratio, domestic savings/GDP ratio as well as reforms to ensure the efficiency and development of the financial system.

JEL: E4, G2

KEYWORDS: Reforms, Vector error correction model, economic growth, financial deepening

INTRODUCTION

Financial liberalization includes interest rate reform, reduction of credit control, free entry into the banking sector, autonomy to the banking sector, private participation in banking and liberalization of capital flows (Odhiambo and Akinboade, 2009). Interest rate reform, as a policy under financial sector liberalization, has occupied a central position in the liberalization process. The goal of interest rate reform is to achieve efficiency in the financial sector and engendering financial deepening. Nnanna and Dogo (1998) viewed financial deepening as a financial system which is largely free from financial repression. Under such a liberalized system, the market should determine the behavior of lenders and borrowers. Odhiambo and Akinboade (2009) defined financial deepening as the increase in relative size and role of the financial system in an economy.

In Nigeria, financial sector reforms began with the deregulation of interest rates in August 1987 (Ikhide and Alawode, 2001). Prior to this period, the financial system operated under financial regulation, and interest rates were repressed. According to McKinnon (1973) and Shaw (1973), financial repression arises mostly when a country imposes ceilings on deposit and lending rates at a low level relative to inflation. The resulting low or negative interest rates spreads discourage saving mobilization and channelling of mobilized savings through the financial system. This has a negative impact on the quantity and quality of investment and hence economic growth.

The main argument of McKinnon- Shaw (1973) was that an increase in the real interest rate may induce savers to save, which generates more investment. Therefore, the expectation of interest rate reform was to encourage domestic savings and make loanable funds available in the banking system. However, the "tunnel-like" structure of interest rates (Ojo, 1976) in Nigeria was capable of discouraging savings and retarding growth in view of the link between savings, investment and economic growth. The critical questions, therefore, are: Does interest rate reform has any positive effect on economic growth in Nigeria? Will deregulation of the financial system speed up capital accumulation and economic growth in the country?

The aim of this study is to determine the relationship between interest rate reforms and financial deepening in Nigeria, using the Vector Error Correction Model (VECM) on annual data from 1973 to 2009. The study tests whether there is any significant relationship between interest rate reforms and financial deepening in Nigeria. Interest rate reform and financial deepening were proxied by deposit rates and the monetization variable, broad money (M2)/GDP, respectively. The paper is relevant in view of the pivotal role played by interest rates in the saving-investment and growth relationship, as well as the need to provide capital for the private sector. The private sector is a catalyst in the development process. The motivation for this study is to provide both theoretical and empirical evidence on the relationship between interest rate reforms and financial deepening in Nigeria. The findings will provoke financial policies that will promote economic growth in the country.

The paper is organized as follows. Section 2 discusses the literature on the link between interest rate reforms and financial deepening. Section 3 presents the data and methodology used in the study. Section 4 is presents the results of the analysis, and Section 5 provides concluding comments.

LITERATURE REVIEW

The relationship between interest rate reforms and financial deepening has been recognized in the literature on finance and development, and can be traced to the McKinnon (1973) and Shaw (1973) hypotheses. McKinnon-Shaw (1973) argued that financial repression reduces the real rate of growth of the economy. Financial repression refers to government fixing interest rates and its adverse consequences on the financial sector and economy. One of the basic arguments of the McKinnon-Shaw model is an investment function that responds negatively to the effective real rate of interest and positively to the growth rate. The McKinnon-Shaw (1973) school of thought is financial liberalization exerts a positive effect on the rate of economic growth in both the short and medium term. This implies that interest rate reforms resulting from financial liberalization, as opposed to financial repression, increase savings into the banking system and investment through credit availability (Agenor and Montiel, 1996). As Ucer (1997) argues , positive real interest rates resulting from financial liberalization lead to financial deepening, or a higher level of intermediation, as demand for money, defined as savings and term deposits as well as checking accounts and other currency increases as the proportion to national income, which in turn, promotes growth. According to Ucer (1997), the important role played by interest rates in savings, investment and economic growth makes the removal of interest rate controls a centrepiece of the liberalization process.

Interest rates policy in Nigeria is discussed along the dividing period of pre-reform (1976-1985) and post-reform (1986-2009) periods. In order to compare the structure of interest rates between the sub-periods, Table 1 showed savings rate, maximum lending rate, savings-lending rate spread and the minimum rediscount rate to demonstrate the relationship among these four rates as the reform process progresses.

The period before 1986 was a period of financial repression, characterized by a highly regulated monetary policy environment in which policies of directed credits, interest rate ceiling and restrictive monetary expansion were the rule rather than the exception (Soyibo and Olayiwola, 2000). Although interest rate policy instruments remained fixed there were marginal increases. For instance, the savings rate was increased from 4% in 1975 to 9.5% in 1986, while the maximum lending rate rose from 9% to 12% within the same period.

For the reform period, savings and maximum lending rates were determined by market forces. During this time interest rates increased as envisaged. For instance, following the reform, the nominal savings and maximum lending rates rose from 9.5% and 12% in 1986 to 14% and 19.2% respectively in 1987. By 1990, the savings and maximum lending rates have rose to 18.8% and 27.7% respectively. This interest rate behavior confirms the study by Asamoah (2008) who found when financial markets are

highly liberalized, more financial institutions are started and competition sets in. This process gives rise to competitive interest rates, which are higher than pre-liberalization interest rate. The government intervened in 1991 and pegged the deposit and lending rates at 14% and 21% respectively. Unfortunately, between 1997 and 2006, the maximum lending rate did not show a significant reduction, with an average of 22%, despite the declining trend in the savings rate, averaging 5%.

Table 1: Trends in Selected Interest Rates in Nigeria, 1973 – 2009

Year	**76**	**77**	**78**	**79**	**80**	**81**	**82**	**83**	**84**	**85**
Savings Rate	4.0	4.0	5.0	5.0	6.0	6.0	7.5	7.5	9.5	9.5
Max. Lending Rate	10.0	6.0	11.0	11.0	9.5	10.0	11.75	11.5	13.0	11.75
Savings-Lending Rate spread	6.0	2.0	6.0	6.0	3.5	4.0	4.25	4.0	3.5	2.25
Min. Redis-count Rate	3.5	4.0	5.0	5.0	6.0	6.0	8.0	8.0	10.0	10.0
Year	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**
SavingsRate	9.5	14.0	14.5	16.4	18.8	14.29	16.1	16.66	13.50	12.61
Max. Lending Rate	12.0	19.20	17.6	24.6	27.7	20.8	31.2	36.09	21.00	20.79
Savings-Lending Rate spread	2.5	5.20	3.1	8.2	8.9	6.51	15.1	19.43	7.50	8.18
Min. Redis-count Rate	10.0	12.75	12.75	18.5	18.5	14.5	17.5	26.00	13.50	13.50
Year	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**
Savings Rate	11.69	4.80	5.49	5.33	5.29	5.49	4.15	4.11	4.19	3.83
Max. Lending Rate	20.86	23.32	21.34	27.19	21.55	21.34	30.19	22.88	20.82	19.49
Savings-Lending Rate spread	9.17	18.52	15.85	21.86	16.26	15.85	26.04	18.77	16.63	15.66
Min. Redis-count Rate	13.50	13.5	14.31	18.00	13.50	14.31	19.00	15.75	15.00	13.00
Year	**06**	**07**	**08**	**09**						
Savings Rate	3.14	3.55	2.84	2.88						
Max. Lending Rate	18.70	18.36	18.70	22.90						
Savings-Lending Rate spread	15.56	14.81	15.86	20.02						
Min. Redis-count Rate	12.25	8.75	9.81	7.44						

The table shows the trends in the savings rate, maximum lending rate, savings-lending rate spread and minimum rediscount rate in Nigeria from 1973 to 2009. Note: Monetary Policy Rate (MPR) replaced Minimum. Rediscount Rate (MRR) with effect from December 11, 2006
Source: CBN Statistical Bulletin, 2009

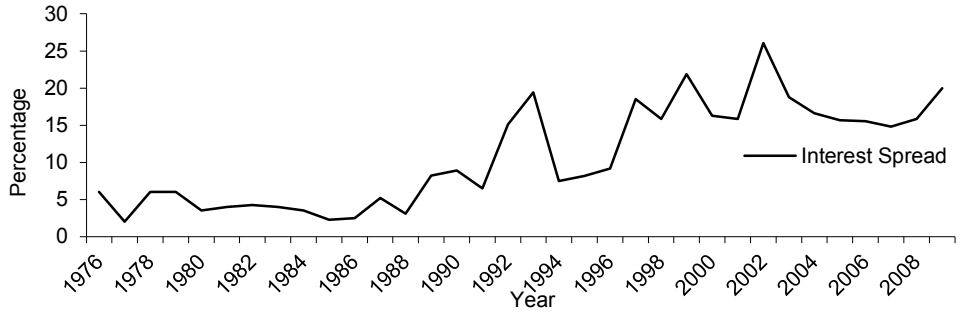
The implications of the "tunnel-like" structure of interest rates and low savings rates are that savings will be discouraged, negatively affecting funds mobilization by the banks. This will in turn affect the amount of funds available for investment with a retarded influence on economic growth. On the other hand high lending rates are detrimental to productive investment and hence economic growth. As Soyibo and Olayiwola (2000) observe, borrowers with worthwhile investments may be discouraged from seeking loans and the quality of applicants could change adversely. Again, high lending interest rates could create a moral hazard where loan seekers borrow to escape bankruptcy rather than invest or finance working capital. Generally, behavior of the interest rate structure is such that there is a wide margin between savings and maximum lending rates, which may encourage speculative financial transactions.

As Edirisuriya(2008) suggested, a commonly used measure to evaluate benefit from financial sector reforms is the interest spread or interest margin of banking institutions. The interest spread is the difference between interest income and interest expenditure. Theoretically, interest margins decline with competition among banks.

Figure 1 reveals the interest margin of Nigerian banks, which marginally declined in 1985, then increased until 1992, before nose-diving to very low level of 1.6 per cent in 1993. The major reason for the decline in 1993 was competition among banks in the country. The number of banks in the country increased from a low level of 40 in 1985 to about 120 by 1993. Thereafter, the spread has steady increased, reaching a

peak of 24.6 per cent in 2002. Implication of the situation depicted by the interest rate spread is that interest rate reform has not improved bank efficiency. This is because the efficiency of a financial system is gauged by how quickly and cheaply the financial system is able to channel funds from surplus economic agents to the deficit agents for productive investments, while ensuring reasonable returns for the financial intermediaries.

Figure 1: Savings-Lending Rate in Nigeria, 1976 -2009



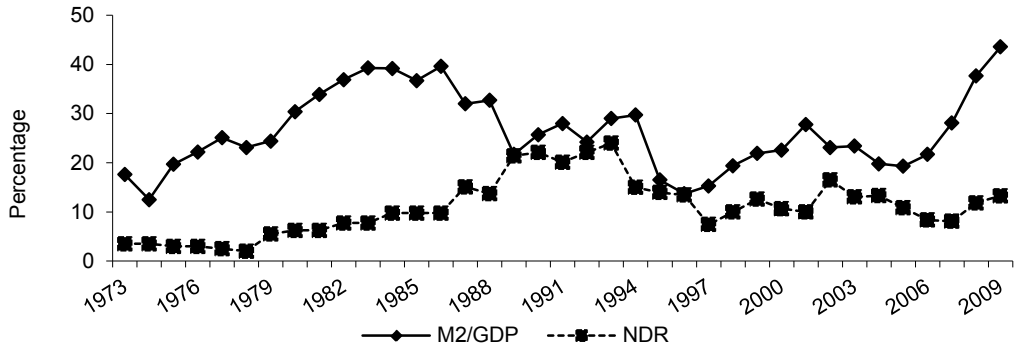
Interest margin of Nigerian banks, which marginally declined in 1985, then increased until 1992, before nose-diving to very low level of 1.6 per cent in 1993. The major reason for the decline in 1993 was competition among banks in the country. The number of banks in the country increased from a low level of 40 in 1985 to about 120 by 1993.

Outreville (1999) reported that the readily available traditional measures of financial deepening in developing countries are quantity indicators based on monetary and credit aggregates. The monetization variable, broad money (M2)/GDP, which measures the overall size of the financial intermediary sector, has an impact on financial deepening and is strongly correlated with both the level and rate of change of real GDP per capital. For instance, Outreville, (1999) observes that savings deposits increase as the financial system expands. In Nigeria, the indicator of financial development, M2/GDP, which measures the relative size of the financial sector has a rising trend since 1997. As Nanna and Dogo (1998) argue, freeing the financial system from repression through interest rate reforms, contributes to financial deepening, which Odhiambo and Akinboade(2009) postulate will increase the relative size and role of the financial system in the economy.

Figure 2 shows that the M2/GDP ratio increased from 36.7 per cent just before the interest rate reform to a high level of 43.6 per cent in 2009. Figure 2 reveals that financial deepening and interest rates exhibited downward trends, especially between 1990 and 1997 as a result of the government policy of guided deregulation. This policy of financial repression has the tendency to discourage savings and inhibit financial development in a country. However, a full implementation of the liberalization policy thereafter led to rising deposit rates and increasing financial deepening in the country. This implies that interest rate reform has contributed to financial deepening, which in turn, contributed to economic growth by improving the productivity of investment.

From the foregoing literature review we deduce that financial reform leads to financial deepening, which encourages competitive interest rates and economic growth. This goal of this study is to investigate empirically this relationship, using most recent data in Nigeria.

Figure 2: Interest Rate and Financial Deepening in Nigeria, 1973-2009



Note: M2/GDP means financial deepening and NDR represents bank deposit rate

DATA AND METHODOLOGY

The econometric analysis covered the period of 1973 - 2009. Data were obtained mainly from publications of the Central Bank of Nigeria, the Statistical Bulletin, Annual Reports and Financial Statements, Banking Supervision and Annual Reports, and supplemented with data from other secondary sources. Trend analysis was used to determine the relationship between interest rate reform and financial deepening. To assess the strength and robustness of the regression analyses, the study includes those variables that are associated with financial development (Greenwood and Smith, 1997; Outreville, 1999). Drawing from the earlier work of Boyd *et al*.(1996), Nnanna and Dogo(1998), Outreville(1999), Odhiambo and Akinboade(2009) and Cheang(2004), we conceptualize a modified model of measuring financial deepening. The financial deepening model for this study is specified as:

$$Financial\ Depth = \beta_0 + \beta_1 Deposit\ Rate_t + \beta_2 Inflation_t + \beta_3 Lagged\ Value\ of\ Financial\ Depth + \beta_4 Growth\ Rate + \beta_5 Savings/GDP\ Ratio_t + \beta_6 Exchange\ Rate_t + \beta_7 Liqudity\ Ratio_t + \beta_8 Financial\ Shift_t + \varepsilon_t$$

The study regressed the financial deepening variable(M2/GDP) on the nominal deposit rate(NDR), inflation rate(IFR), the lagged value of financial depth($M2/GDP_{t-1}$), growth rate of gross domestic product(GRG), domestic savings/GDP ratio(SAV), exchange rate(EHR), liquidity reserve ratio(LRR) and shift in financial policy from regulation to deregulation of interest(FPS). Finally, ε_t is an error term, which is assumed to be independent and identically distributed with mean zero and constant variance and β_0, β_1 β_2 are parameters to be estimated.

A priori expectation was that deposit rate, financial deepening lagged once, gross domestic product, savings to GDP, and financial reform are positively related to financial deepening, while inflation rate, exchange rate and liquidity reserve ratio are negatively related to financial deepening. The deposit rate was included to capture the effect of interest rate reform on financial deepening. The inclusion of inflation was to capture the effect of inflation on the various components of money. The exchange rate variable was included because exchange rate regime constitutes a major issue regarding monetary stability, which is required for financial stability. The liquidity reserve ratio measures the level of liquidity in banks. A declining liquidity reserve ratio is usually associated with increasing lending activities as a result of reform processes. Haslag and Koo(1999) investigated the relationship between financial repression measures and the level of financial development. They found that countries with high reserve ratios tend to be countries that have less developed financial systems. A dummy variable was included to incidate the financial situation, in which 0 indicates a period of financial regulation and 1 for financial deregulation.

To avoid spurious regression, which results from the regression of two or more non-stationary time series data, the time series properties of all the variables were ascertained. This implies the time series have to be detrended before any sensible regression analysis can be performed. In other words, time series analysis was carried out to examine the data for stationarity or non-stationarity problems, using Augmented Dickey-Fuller (ADF) and Phillips-Perron (P-P) tests. The next step was to establish whether the non-stationary variables were cointegrated. The Johansen was used test to confirm the existence of a long run equilibrium relationship between variables. If cointegration is established, an Error Correction Model is specified to present short run dynamics while preserving the long run equilibrium relationship.

EMPIRICAL RESULTS

The econometric analysis was performed using Stata 10. Dickey Fuller test and Phillips-Perron (P-P) tests were used to test the stationarity of each of the variables and its order of integration. The tests examined the null hypothesis that the specified variable has a unit root against the alternative hypothesis that the variable is stationary. The tests were performed with various combinations of lag lengths (up to 4) and inclusion and exclusion of a constant in the Autoregressive equations (AR).

Table 2: Test of Order of Intergration or Unit Root Test

Series	Order of Integration
Growth Rate	I(0)
Financial Depth	I(1)
Exchange Rate	I(1)
Deposit Rate	I(1)
Inflation Rate	I(0)
Liquidity Ratio	I(0)
Savings/GDP ratio	I(1)

The table shows the variables used for the model. The variables include: financial deepening; nominal deposit rate, inflation rate; gross domestic product; domestic savings/GDP ratio; exchange rate; liquidity reserve ratio; and shift in financial policy from regulation to deregulation of interest. I(0) means stationary at levels, while I(1) means stationary at first difference.

The results of the Augmented Dickey-Fuller(ADF) and Phillips-Perron (P-P) in Table 2 show that only the growth rate of gross domestic product, inflation rate and liquidity reserve ratio variables were stationary in their level forms. The other variables, financial development(M2/GDP), exchange rate, deposit rate and domestic savings to GDP were stationary at their first difference implying they are integrated of order one.

Since the study deals with a multivariate case, it uses the Vector Error Correction Model (VECM). The study transformed of some of the variables to get a reasonable model. Specifically, M2/GDP and SAV were squared. The VAR (Vector Auto-regressive) model was estimated to determine the optimal lag. The VAR table is not presented since it has been established that there are variables that are integrated of order 1. Once cointegration is tested and confirmed, then the optimal lag order of the variable was selected by using either Likelihood Ratio(LR) test, Final Prediction Error (FPE), Akaike Information Criterion (AIC) or Hanna and Quinn Information Criterion (HQIC) or the Schwarz Bayesian Criterion (SBIC). The decision for this study was made based on the Likelihood ratio (LR) test. From Table 3 the Likelihood Ratio test shows that the optimal lag length is 3.

Table 3: VAR Model Estimating the Optimal Lag

Lag	LL	LR	DF	P	AIC	HQIC	SBIC
0	-1116.9				66.175	66.397	66.534
1	-933.08	376.67	64	0	59.123	60.225	62.355
2	-833.28	199.61	64	0	57.017	59099	32.122
3	-673.57	319.41*	64	0	51.387*	54.45*	60.365

The table shows the variance auto-regressive model used for estimating the optimal lag. LR means Likelihood Ratio, FPE (Final Error of Prediction), AIC (Akaike Information Criterion), HQIC (Hanna and Quinn Information Criterion) and the SBIC (Schwarz Bayesian Criterion). "" indicates significance of the test*

Once the lag order has been determined, the long run and short run coefficients of the model are estimated. The study proceeded to establish the long-run cointegrating relationship among the variables by using the Johansen cointegrating test. The results in Table 4 reporte the trace and maximum eigenvalue statistics showing that the null-hypothesis of no-cointegrating vector linking financial deepening and its determinants is rejected at the 5 per cent level of significance.

Table 4: Johansen Maximum Likelihood Cointegration Test Results

Rank Max VAlue	Parms	LL	Eigenvalue	Trace Statistic	5% Critical
0	136	-871.96		396.77	156
1	151	-809.86	0.974	272.57	124.24
2	164	-762.92	0.937	178.70	94.15
3	175	-728.68	0.867	110.23	68.52
4	184	-701.51	0.798	55.873	47.21
5	191	-687.84	0.553	28.53*	29.68
6	196	-680.47	0.352	13.79	15.41
7	199	-673.82	0.323	0.504	3.76
8	200	-673.57	0.147		

The table shows that at most, five cointegrating relationships exist among financial deepening and its determinants, indicating a unique long run relationship. "" indicates significance of the test*

The trace test statistics reveal that there are, at most, five cointegrating relationships among financial deepening and its determinants. Since the trace statistics takes into account the smallest eigenvalues, it possesses more power than the maximum eigenvalue statistics. Johansen and Juselius (1990) cited in Owoye and Onafowora (2007) recommend the use of trace statistics when there is a conflict between the two statistics. The conclusion drawn from the results is that there exists a unique long run relationship between financial deepening (M2/GDP) and its determinants, nominal deposit rate, inflation rate, the lagged value of financial depth, gross domestic product, domestic savings/GDP ratio, exchange rate, liquidity reserve ratio and shift in financial policy from regulation to deregulation of interest.

In the short run, deviations from this relationship could occur due to shocks to any of the variables. Therefore, Soyibo and Olayiwola (2000) suggest that the short-run interactions and adjustment to long-run equilibrium are important because of the policy implications. As shown in Table 5, the vector error correction model (VECM) was applied to analyse the short-run dynamics. The model is significant at 1% level as shown by the chi squared statistic. The R-squared is equally impressive at 76.86%.

The analysis in Table 5 indicates that the error correction co-efficient is significant implying a long run equilibrium relationship between financial deepening, interest rates and other independent variables. The co-efficient of the long run relationship is negative and significant meaning that when there is a shock in the system, it returns to equilibrium. The error correction term has the expected negative sign and is significant. The absolute value of the coefficient of the error-correction term (ECMt-1) indicates that about 210 per cent of disequilibrium in financial deepening is offset by short-run adjustment in each year. Lagged difference of the financial development variable (M2/GDP) enters the model and is significant at the 5% level meaning that financial development (M2/GDP) is auto regressive. The results also indicate the first lags of gross domestic product, liquidity reserve ratio, domestic savings/GDP ratio and shift in

financial policy from regulation to deregulation of interest variables are significant at the 5% level. In addition the 2nd lag difference of domestic savings/GDP ratio, shift in financial policy from regulation to deregulation of interest and gross domestic product are also significant at 10%, 10% and 1% levels respectively. This is evidence of granger causality.

Table 5: Regression Results of the Chi-squared Statistics and Model Parameters

Equation	Parms	RMSE	R-sq	chi2	P>chi2
D_Financial Depth2	18	189.51	0.7686	53.13896	0.0002
		Coefficient	**Std. Err**	**z**	**P>z**
Error Correction Modelt-1					
Lag value of ECM		-2.10119	0.757616	-2.77	0.006*
Financial Depth^2					
Lag value of fin. Depth		1.9007	0.831	2.29	0.022*
Second lag value of fin. depth		0.180176	0.625589	0.29	0.773
Deposit Rate					
Lag value of deposit rate		18.40889 -	17.30942	1.06	0.288
Second lag value of deposit rate		7.48689	14.2574	-0.53	0.599
Inflation Rate					
Lag value of inflation rate		-2.75952	2.764221	-1	0.318
Second lag value of inflation rate		1.240543	2.526251	0.49	0.623
Growth Rate of GDP					
Lag value of growth rate		86.2035	35.11679	2.45	0.014*
Second lag value of growth rate		40.79866	15.91789	2.56	0.01*
Saving/gross domestic ratio					
Lag value of saving/GDP ratio		-137.226	83.97778	-1.63	0.102
Second lag value of saving/GDP ratio		-38.0428	75.09875	-0.51	0.612
Exchange rate^2					
Lag value of exchange rate		-0.07531	0.043049	-1.75	0.08*
Second lag value of exchange rate		-0.07256	0.040094	-1.81	0.07*
Liquidity ratio					
Lag value of liquidity ratio		-20.9972	6.956709	-3.02	0.003*
Second lag value of liquidity ratio		-0.64625	6.204856	-0.1	0.917
Financial Shift in Policy					
Lag value of financial shift		-491.486	418.955	-1.17	0.241
Second lag value of financial shift		767.6252	423.7548	1.81	0.07*
Constant		85.70848	42.4977	2.02	0.044*

*The table shows the regression results, Chi-squared Statistics and Model Parameters. The table is separated into row segments. The regressor appears first followed by the lagged difference and the second lagged difference. The table shows the variables with the dependent variable on top (D_Financial Depth2 i.e. first difference of squared M2/GDP). The dependent variable is financial deepening, while the independent variables are nominal deposit rate, inflation rate; lagged value of financial depth; gross domestic product; domestic savings/GDP ratio; exchange rate; liquidity reserve ratio; and shift in financial policy from regulation to deregulation of interest. ECMt-1: is the error correction parameter. The variables marked with * are significant.*

The study went further to conduct a Lagrange-multiplier autocorrelation test on the residuals. The Table 6 results show the null hypothesis of no autocorrelation is accepted at 5% at both lags.

Table 6: Lagrange-multiplier autocorrelation test

Lag	**Chi2**	**DF**	**Prob>chi2**
1	73.20	64	0.2016
2	70.47	64	0.2701

This table shows the test for no autocorrelation in the error terms

CONCLUDING COMMENTS

This study empirically investigates the effect of interest rate reforms on financial deepening in Nigeria, using time series data from 1973 - 2009. Interest rates are expected to play a pivotal role in the saving-investment –growth relationship, as well as ensuring the provision of the needed capital for the private sector, which are a catalyst in the development process. The motivation for this study, therefore, is to provide both theoretical and empirical evidence on the significant relationship between interest rate

reforms and financial deepening in Nigeria. Most previous studies are theoretical.

The methodology adopted for the study includes the cointegration and vector error correction model (VECM) to determine the long and short run dynamics of the model. Financial deepening was proxied by the monetization rate (M2/GDP), which measures the relative size and role of the financial system in the economy, while the interest rate reform was proxied by the deposit rate. The study regressed the financial deepening variable (M2/GDP) on the nominal deposit rate, inflation rate, the lagged value of financial depth, growth rate of gross domestic product, domestic savings/GDP ratio, exchange rate, liquidity reserve ratio and shift in financial policy from regulation to deregulation of interest.

The results indicate that there exists a long run relationship between financial deepening and interest rates. It was also demonstrated that interest rate reform has a positive and significant effect on financial deepening in Nigeria. The findings corroborate the work of Asamoah (2008) that financial reforms lead to competition in the financial markets, thereby raising interest rates to encourage savings and making funds available for investment. This process ultimately leads to economic growth.

Based on the findings, the study recommended that policy makers influence financial development, economic growth, liquidity reserve ratio, domestic savings/GDP ratio, and conduct financial reforms to ensure the efficiency and development of the financial system. The findings will provoke financial policies that will promote economic growth in the country. Future research on the effect of financial reforms on economic deepening should take into consideration the magnitude of the effect and the level of democratization in the country.

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PRICING OF PAYMENT DEFERRED VULNERABLE OPTIONS AND ITS APPLICATION TO VULNERABLE RANGE ACCRUAL NOTES

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ABSTRACT

This paper derives a pricing model for payment deferred vulnerable options and applies the results to the pricing of vulnerable range accrual notes. The valuation model for vulnerable options takes into account the possibility of the option writer defaulting. However, when the payment date is set later than the option maturity date, the valuation model will be incomplete if the default risk between the option maturity and payment dates is not explicitly incorporated. We extend the current available models and our results show that the default risk of the option writer will further reduce the option value if the payment date is after the maturity date. The analysis of vulnerable range accrual note, which contains multiple payment deferred vulnerable options, is also performed. Due to the product design, the pricing model for vulnerable range accrual notes shows that the relationship between volatility and note value is not monotonic but depends on whether the underlying price is within, outside, or on the range boundary.

JEL: G12; G13

KEYWORDS: Reduced form model, vulnerable options, vulnerable range accrual notes

INTRODUCTION

This paper derives a pricing model for payment deferred vulnerable options and applies the results to the pricing of vulnerable range accrual notes. The valuation model for vulnerable options takes into account the fact that the option writer may default. However, when the payment date is set later than the option maturity date, a common arrangement in the OTC structured products market, the valuation model will be incomplete if the default risk between the option maturity and payment dates is not explicitly incorporated. We extend the current available models, which usually assume that the option maturity and payment dates are identical. Our results show that the default risk of the option writer will further reduce the option value if the payment date is after the maturity date.

One practical application of the payment deferred vulnerable option valuation model is in the valuation of vulnerable range accrual notes. Range accrual notes are structured products. Its payoff is defined as the interest payment computed as the proportion of the number of days that the reference underlying asset price lies within a specified range times the interest rate specified at the initiation of the note. The specified interest rate is usually set much higher than the interest rate currently available on the market. Therefore, it gives the note holders a chance to get higher earnings. For this reason, the range accrual note is attractive to investors, especially in a low interest rate environment. The analysis of vulnerable range accrual note, which contains multiple payment deferred vulnerable options, is also performed.

The paper is organized as follows. Section 2 provides a pricing model for payment deferred options. Since range accrual notes can be regarded as combinations of range options, which are combinations of digital options, Section 3 discusses the valuation of digital options and range options. Section 4 then applies the results in Sections 2 and 3 to the pricing of vulnerable range accrual notes. Finally, Section 5 presents our conclusions.

LITERATURE REVIEW

Black and Sholes (1973) value options by constructing a no-arbitrage portfolio and employ the partial differential equation (PDE) technique to derive the closed-form solution for European options. The martingale pricing method (Harrison and Kreps, 1979; Harrison and Pliska, 1981) is efficient in reducing the complexity of pricing processes, and it is now widely used in option valuation. Cox, Ross, and Rubinstein (1979) propose the binomial option pricing model that can handle various types of options, especially American options. For more complex options such as path-dependent options, it is more suitable to apply the Monte Carlo simulation method (Boyle, 1977).

To address the credit risk that the option writer may default, valuation models based on the structural approach (Merton, 1974) have been proposed by various researchers. Notably, Johnson and Stulz (1987), Klein (1996), and Klein and Inglis (1999, 2001) derive pricing models for plain vanilla vulnerable options, assuming that the possible default time may occur on the option maturity date. Liao and Huang (2005) extend the model to assume that the possible default time may be anytime before the option maturity date.

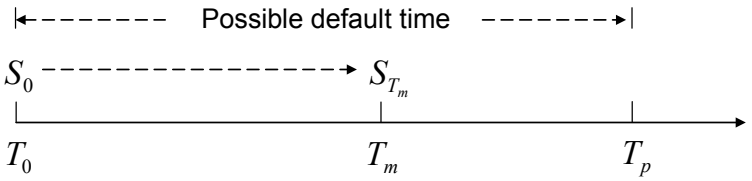
The structural approach for pricing European vulnerable options usually assumes that the evolution of the total asset value of the option writer follows a stochastic process in addition to the process followed by the underlying asset price of the option. As well-documented as it is in literature, it is difficult to estimate the volatility parameter for the process followed by the total asset value of the option writer. Empirically, when the two processes are not required simultaneously, the volatility parameter estimated for the stock price is used as a proxy for the total asset value (Gray *et al*., 2007). However, the legitimacy of this practice has always been questioned. The reduced form approach may circumvent this problem in the pricing of vulnerable options, as proposed by Jarrow and Turnbull (1995) and Hull and White (1995), among others. Therefore, in this paper, we employ the reduced form model to describe the default process of the option issuer and extend the research of vulnerable option pricing to payment deferred vulnerable option.

Turnbull (1995) assumes the term structure is exogenous and derives the closed-form solution of an interest rate range note. Navatte and Quittard-Pinon (1999) price range notes through a derivation of the embedded European range digital option value. They assume that the interest rate dynamics follows a one-factor linear Gaussian model and employ the change of numeraire approach to derive analytical solutions. Nunes (2004) extends the Navatte and Quittard-Pinon model to a multifactor HJM term structure. Eberlein and Kluge (2006) generalize the afore-mentioned results to the multivariate levy term-structure. Our paper differs from the above in that the option is assumed to be vulnerable.

PRICING OF PAYMENT DEFERRED OPTIONS

A payment deferred option can be described with Figure 1. In Figure 1, T_m is the option maturity date, on which the payoff is decided; T_p is the payment date; S_0 is the underlying price at the initiation of the option; and S_{T_m} is the underlying price on the option maturity date. The difference between a payment deferred option and a plain vanilla option is that the payment date of a plain vanilla is set identical to the option maturity date, and the payment date of a payment deferred option is set later than the option maturity date. This situation is usually seen in some structured notes, such as range accrual notes.

Figure 1: The Vulnerable Payment Deferred Option



This figure illustrates that the possible default time of the option writer is in the time period between the initiation T_0 and the payment date T_p of the option. Once the option writer default, the option holder will not receive the exercise value when the option is in the money at the maturity date.

Assuming that the underlying asset price follows a geometric Brownian motion, its dynamic under risk neutral probability measure Q is governed by the following process:

$$\frac{dS_t}{S_t} = (r-q)dt + \sigma\, dW_t^Q \tag{1}$$

where S_t is the underlying asset price at time t; r is the risk free rate; q is the dividend rate of the underlying asset; σ is the volatility of the underlying asset price return; W_t^Q is the Wiener process under probability measure Q; and $dW_t^Q \sim N(0, dt)$. Using Itô Lemma, we obtain the following equation:

$$d\ln S_t = (r - q - \frac{\sigma^2}{2})dt + \sigma\, dW_t^Q \tag{2}$$

By integrating both sides of Equation (2), the dynamic process of the asset price can be described as:

$$\ln S_{T_m} = \ln S_t + (r - q - \frac{\sigma^2}{2})(T_m - t) + \sigma (W_{T_m}^Q - W_t^Q) \tag{3}$$

where $(W_{T_m}^Q - W_t^Q) \sim N(0, T_m - t)$.

Assuming that the default time of the option writer τ_D follows an exponential distribution:

$$\Pr^Q(\tau_D \le T_p | F_t) = 1 - e^{-\lambda(T_p - t)} \tag{4}$$

where $\Pr^Q(\bullet)$ is the probability function in risk neutral probability measure, F_t is the information set at time t, λ is the default intensity of the option writer, and λ is a constant.

Following Jarrow and Turnbull (1995) and Hull and White (1995), we assume that the process for the asset underlying the option is independent of the credit risk of the option writer. This assumption amounts to considering that the option writer is a large, well-diversified financial institution, a realistic assumption as observed in emerging markets. Suppose that the loss rate of the issuer default is β, $0 \le \beta \le 1$, and that the issuer default process is independent of the dynamic process of the underlying price. The value of a payment deferred vulnerable call option $C(t)$ can then be derived as follows:

$$
\begin{aligned}
C(t) &= e^{-r(T_p-t)}\left\{E^Q\left[(1-\beta)(S_{T_m}-K)^+ 1_{\{\tau_D \le T_p\}}\middle|F_t\right] + E^Q\left[(S_{T_m}-K)^+ 1_{\{\tau_D > T_p\}}\middle|F_t\right]\right\} \\
&= e^{-r(T_p-t)}E^Q\left[(S_{T_m}-K)^+ - \beta(S_{T_m}-K)^+ 1_{\{\tau_D \le T_p\}}\middle|F_t\right] \\
&= e^{-r(T_p-t)}\left\{E^Q\left[(S_{T_m}-K)^+\middle|F_t\right] - \beta E^Q\left[(S_{T_m}-K)^+\middle|F_t\right]E^Q\left[1_{\{\tau_D \le T_p\}}\middle|F_t\right]\right\} \\
&= e^{-r(T_p-t)}\left[1-\beta\Pr^Q(\tau_D \le T_p|F_t)\right]\left[S_t e^{(r-q)(T_m-t)}N(d_1) - KN(d_2)\right] \\
&= e^{-r(T_p-T_m)}\left[1-\beta\left(1-e^{-\lambda(T_p-t)}\right)\right]\left[S_t e^{-q(T_m-t)}N(d_1) - Ke^{-r(T_m-t)}N(d_2)\right]
\end{aligned}
\tag{5}
$$

where $E^Q[\bullet]$ is the expectation under risk neutral probability measure Q,
$N(\bullet)$ is the cumulative standardized normal distribution function,

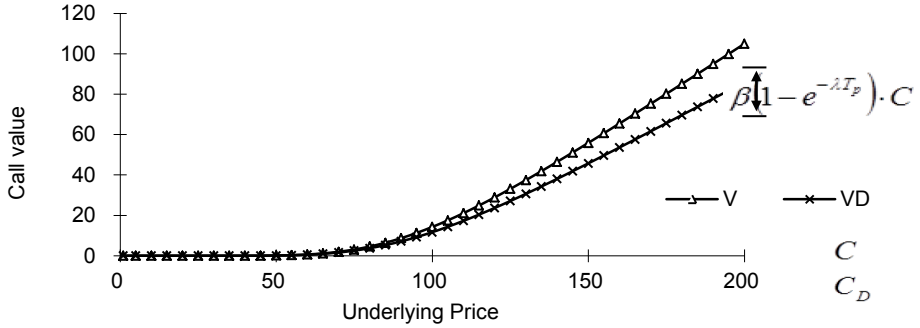
$d_1 = \dfrac{\ln\frac{S_t}{K} + (r-q+\frac{\sigma^2}{2})(T_m-t)}{\sigma\sqrt{(T_m-t)}}$, and $d_2 = \dfrac{\ln\frac{S_t}{K} + (r-q-\frac{\sigma^2}{2})(T_m-t)}{\sigma\sqrt{(T_m-t)}}$.

Similarly, the value of a payment deferred vulnerable put option $P(t)$ is

$$
P(t) = e^{-r(T_p-T_m)}\left[1-\beta\left(1-e^{-\lambda(T_p-t)}\right)\right]\left[Ke^{-r(T_m-t)}N(-d_2) - S_t e^{-q(T_m-t)}N(-d_1)\right] \tag{6}
$$

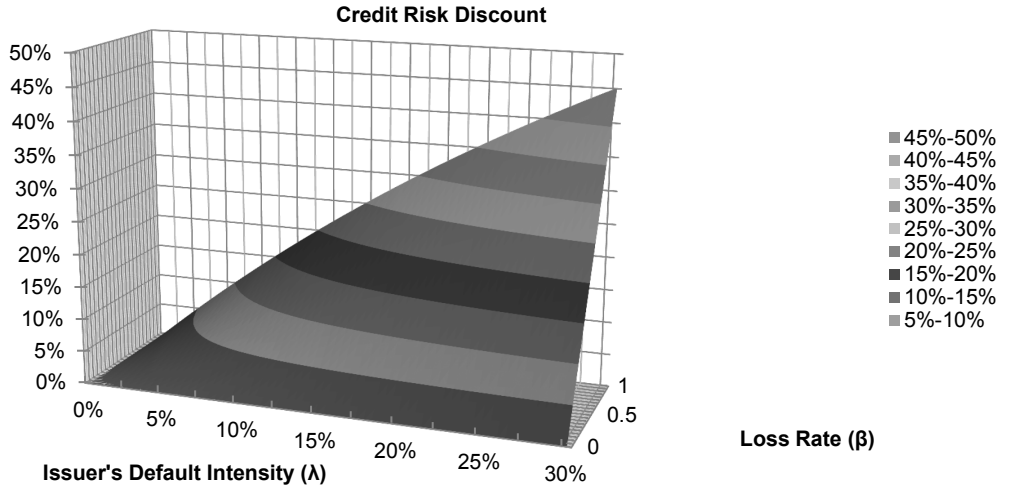
Equations (5) and (6) show that the default risk of the option writer will further reduce the option value if the payment date is later than that of the maturity. When $T_p = T_m$, the payment deferred vulnerable options is reduced to a plain vanilla vulnerable option. In Equation (5), we can see that the value of a payment deferred vulnerable option is the option value without the issuer default risk multiplied by one minus a credit risk discount $\beta\left(1-e^{-\lambda T_p}\right)$, which equals the loss rate β multiplied by the issuer default probability $1-e^{-\lambda T_p}$ before the payment date. The difference in call option values between without issuer default risk C and with issuer default risk C_D is illustrated in Figure 2. Furthermore, as shown in Figure 3, the credit risk discount for the issuer default risk is monotonically positively correlated to the loss rate β and the issuer default intensity λ.

Figure 2: The Call Option Values Without Issuer Default Risk C and With Issuer Default Risk C_D ($K=100$, $T=1$, $\sigma=30\%$, $r=5\%$, $\beta=1$, $\lambda=20\%$)



This figure shows that the option value without issuer default risk is higher than those with issuer default risk and the difference is $\beta\left(1-e^{-\lambda T_p}\right)$*, where* β *is the loss rate,* λ *is the issuer default intensity, and* T_p *is payment date.*

Figure 3: Credit Risk Discount for Issuer Default Risk



This figure shows that the credit risk discount due to the possibility of issuer default is positively correlated to the default intensity of the issuer and the loss rate.

PRICING OF VULNERABLE DIGITAL OPTIONS AND RANGE OPTIONS

Since range accrual notes can be regarded as combinations of range options, which, in turn, are combinations of digital options, we discuss the valuation of digital options and range options in this section. The final payoff of a digital option is decided by the condition that the underlying asset price satisfies certain specifications. The payoff of a digital call (DC) option can be written as follows:

$$DC_T = \begin{cases} H, & if\ S_{T_m} \geq K \\ 0, & otherwise \end{cases} \tag{7}$$

where H is the fixed amount received by the option holder if the digital call option is in the money on the maturity date. Following the settings of the underlying asset price dynamic, the issuer default process, the option maturity date, and the option payment date in the previous section, the value of a vulnerable digital call option will be:

$$\begin{aligned} DC(t) &= e^{-r(T_p-t)}\left\{E^Q\left[(1-\beta)H\cdot 1_{\{K\leq S_{T_m}\}}\cdot 1_{\{\tau_D\leq T_p\}}\middle|F_t\right]+E^Q\left[H\cdot 1_{\{K\leq S_{T_m}\}}1_{\{\tau_D>T_p\}}\middle|F_t\right]\right\} \\ &= e^{-r(T_p-t)}H\cdot E^Q\left[1_{\{K\leq S_{T_m}\}}-\beta\cdot 1_{\{K\leq S_{T_m}\}}\cdot 1_{\{\tau_D\leq T_p\}}\middle|F_t\right] \\ &= e^{-r(T_p-t)}H\cdot\left\{E^Q\left[1_{\{K\leq S_{T_m}\}}\middle|F_t\right]-\beta E^Q\left[1_{\{K\leq S_{T_m}\}}\middle|F_t\right]E^Q\left[1_{\{\tau_D\leq T_p\}}\middle|F_t\right]\right\} \\ &= e^{-r(T_p-t)}H\cdot\left[1-\beta\Pr^Q(\tau_D\leq T_p|F_t)\right]\left[\Pr^Q(K\leq S_{T_m}|F_t)\right] \\ &= e^{-r(T_p-t)}H\cdot\left[1-\beta\left(1-e^{-\lambda(T_p-t)}\right)\right]N(d_2) \end{aligned} \tag{8}$$

Similarly, the payoff of a digital put (DP) option can be written as follows:

$$DP_T = \begin{cases} H, & if\ S_{T_m} \leq K \\ 0, & otherwise \end{cases} \tag{9}$$

Therefore, the value of a vulnerable digital put (DP) option is:

$$DP(t) = e^{-r(T_p - t)} H \cdot \left[1 - \beta\left(1 - e^{-\lambda(T_p - t)}\right)\right] N(-d_2) \tag{10}$$

One type of digital option is the range option, which has a payoff if the underlying asset price lies in the specified range on the maturity date. The payoff of a range option can be written as follows:

$$RO_T = \begin{cases} H, & if\ D \le S_{T_m} \le U \\ 0, & otherwise \end{cases} \tag{11}$$

where D and U are the lower and upper boundaries of the target range, respectively.

If an investor longs a digital call option with the exercise price D and shorts a digital call option with the exercise price U, the payoff is the same as buying a range option with the lower boundary D and the upper boundary U. Thus the value of a vulnerable range option will be:

$$\begin{aligned} RO(t) &= DC_{K=D}(t) - DC_{K=U}(t) \\ &= e^{-r(T_p - t)} H \cdot \left[1 - \beta\left(1 - e^{-\lambda(T_p - t)}\right)\right]\left[N(d^D) - N(d^U)\right] \end{aligned} \tag{12}$$

where $N(\bullet)$ is the cumulative standardized normal distribution function,

$d^D = \dfrac{\ln\dfrac{S_t}{D} + (r - q - \dfrac{\sigma^2}{2})(T_m - t)}{\sigma\sqrt{T_m - t}}$, and $d^U = \dfrac{\ln\dfrac{S_t}{U} + (r - q - \dfrac{\sigma^2}{2})(T_m - t)}{\sigma\sqrt{T_m - t}}$.

PRICING OF VULNERABLE RANGE ACCRUAL NOTES

The final payoff of a range accrual note can be divided into the principal and interest payments. The principal payment is similar to the cash flow of a zero coupon bond and is decided by the principal guarantee ratio, such as 100%, 95%, etc. The interest payment of a range accrual note is defined as the proportion of the number of days that the reference underlying asset price lies within a specified range times an interest rate specified at the start of the contract.

Assume that the nominal of the note is F; the principal guarantee ratio is α; the target range is $[D, U]$, D and U are the lower and upper boundaries of the target range respectively; the note maturity and interest payment date is T_p; the specified interest rate is R; the observation frequency is n; and the observation dates are $T(1)$, $T(2)$, …, $T(n)$. The payment ratio is ϕ, usually sets at around 1 over 260. Some security firms may set this ratio at 1 over 255, and others according to the proportion of trading days in one year. As shown in Figure 4, the interest payment on date T_p can be written as:

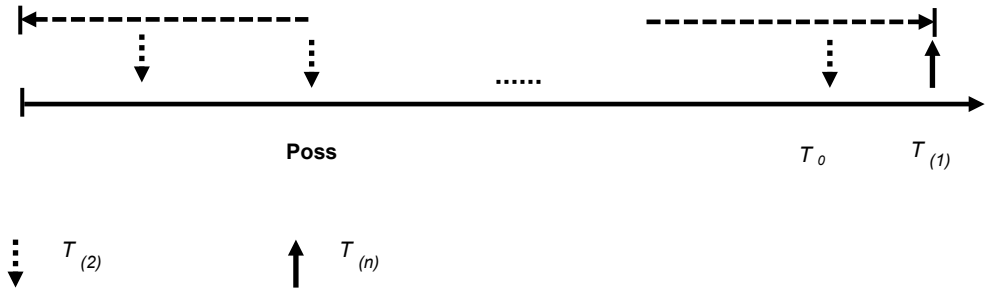
$$Coupon = \sum_{i=1}^{n} \phi \cdot R \cdot F \cdot I_{T(i)} \tag{13}$$

where $I_{T(i)} = \begin{cases} 1, & if\ D \le S_{T(i)} \le U \\ 0, & otherwise \end{cases}$

The indicator function I can be viewed as a range option, the payoff of which is one dollar if the option is in the money and zero if it is out of the money. According to the above setting, the interest payment of a range accrual note can be expressed as the sum of the final payoffs of a series of range options. Therefore,

the value of the range accrual note at time t can be expressed as the sum of the discounted principal payment and a series of range options. We can derive the generalized pricing formula of the vulnerable range accrual note (denoted as $Note$) as follows:

Figure 4: The Observation Date and Payment Date of the Range Accrual Note



This figure illustrates that the observation dates for determination of the coupon payment and the payment date of the coupon. The possible default time of the issuer is in the time period between the initiation of the note and the payment date. Once the issuer default, the note holder will not receive the coupon payment.

$Note(t)$ = the discounted vulnerable principal payment +
the value of a series of vulnerable range options

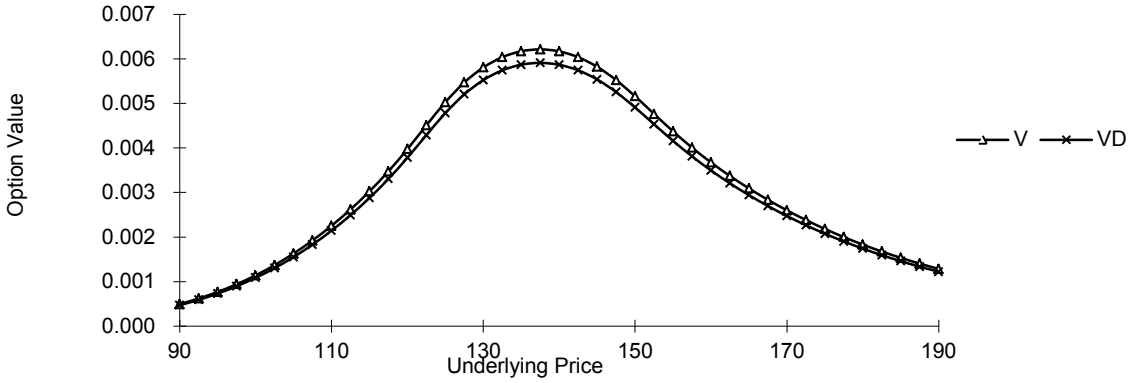
$$
\begin{aligned}
&= e^{-r(T_p-t)}\left\{E^Q\left[(1-\beta)\alpha F\cdot 1_{\{\tau_D\le T_p\}}\middle|F_t\right]+E^Q\left[\alpha F\cdot 1_{\{\tau_D>T_p\}}\middle|F_t\right]\right\}+\\
&\quad e^{-r(T_p-t)}\left\{E^Q\left[(1-\beta)\cdot\sum_{i=1}^{n}\phi RF\, I_{T(i)}\cdot 1_{\{\tau_D\le T_p\}}\middle|F_t\right]+E^Q\left[\sum_{i=1}^{n}\phi RF\, I_{T(i)}\cdot 1_{\{\tau_D>T_p\}}\middle|F_t\right]\right\}\\
&= e^{-r(T_p-t)}\left\{\left[1-\beta(1-e^{-\lambda(T_p-t)})\right]\alpha F+\right.\\
&\quad \left.\sum_{i=1}^{n}\phi RF\left\{E^Q\left[(1-\beta)\cdot I_{T(i)}\cdot 1_{\{\tau_D\le T_p\}}\middle|F_t\right]+E^Q\left[I_{T(i)}\cdot 1_{\{\tau_D>T_p\}}\middle|F_t\right]\right\}\right\}\\
&= e^{-r(T_p-t)}\left\{\left[1-\beta(1-e^{-\lambda(T_p-t)})\right]\alpha F+\left[1-\beta(1-e^{-\lambda(T_p-t)})\right]\phi RF\cdot\sum_{i=1}^{n}E^Q\left[I_{T(i)}\middle|F_t\right]\right\}\\
&= e^{-r(T_p-t)}F\left[1-\beta(1-e^{-\lambda(T_p-t)})\right]\left\{\alpha+\phi R\sum_{i=1}^{n}\left[N(d_i^D)-N(d_i^U)\right]\right\}
\end{aligned}
\tag{14}
$$

where $d_i^D=\dfrac{\ln\dfrac{S_t}{D}+(r-q-\dfrac{\sigma^2}{2})[T(i)-t]}{\sigma\sqrt{T(i)-t}}$, and $d_i^U=\dfrac{\ln\dfrac{S_t}{U}+(r-q-\dfrac{\sigma^2}{2})[T(i)-t]}{\sigma\sqrt{T(i)-t}}$.

The vulnerable option pricing model shows that the default risk of the option writer reduces the option value. This feature also shows up in the valuation of the vulnerable range accrual note. Take a range accrual note as an example to illustrate the price behavior of the embedded option. The underlying asset of this range accrual note is an equity security. The other parameters of this range accrual note are as follows: the note maturity and interest payment date T_p is three months after the issue date; the principal guarantee ratio α is 100%; the underlying asset price on the issue date S_0 is 137; the target range is $[90\%\times S_0,\ 110\%\times S_0]$, which means the lower boundary D is $90\%\times S_0$ and the upper boundary U is $110\%\times S_0$; the payment ratio ϕ is 1/260; the specified interest rate R is 5.3%; the risk free

interest rate is set as the three months Commercial Paper (CP) rate on the issue date, which is 0.943%; the volatility of the underlying asset price return σ is 53.38%; and the dividend yield of the underlying asset q is 0. Figure 5 shows the embedded option values of the range accrual note without issuer default risk V and with issuer default risk V_D for different underlying asset prices.

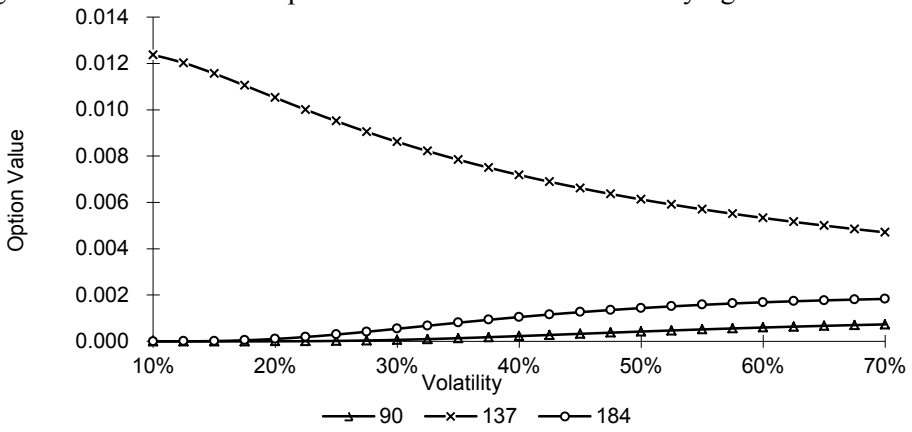
Figure 5: The Embedded Option Values of the Range Accrual Note Without Issuer Default Risk V and With Issuer Default Risk V_D



This figure shows that the option values with issuer default risk V_D is higher than those without issuer default risk V (The issuer loss rate $\beta = 1$; the issuer default intensity $\lambda = 20\%$).

Further, due to the product design, the pricing model for vulnerable range accrual notes demonstrates that the relationship between the underlying asset volatility and the embedded option value is not monotonic but depends on whether the underlying price is within, outside, or on the range boundary. This is shown in Figure 6. Generally speaking, when the underlying asset price is within the target range, the embedded option value increases with decreasing volatility. On the other hand, when the underlying asset price is outside the target range, the embedded option value increases with increasing volatility.

Figure 6: The Embedded Option Values for Different Underlying Asset Volatilities



This figure shows that when the underlying asset price is within the target range, i.e. S_t =137, the embedded option value increases with decreasing volatility. On the other hand, when the underlying asset price is outside the target range, i.e. S_t = 90 and 184, the embedded option value increases with increasing volatility.

The reason for the above findings is that when the underlying asset price is within the target range, the lower the volatility is, the lower the probability that the underlying asset price breaches the target range

will be, which leads to a higher embedded option value. Conversely, when the underlying asset price is outside the target range, the higher the volatility is, the higher the probability that the underlying asset price moves back into the target range will be, which leads to a higher embedded option value.

CONCLUSIONS

In pricing options, it is common to assume that the payment date is identical to the maturity date. The main concern of this paper is the credit risk of the option writer. Therefore, the credit risk involved between option maturity and payment dates should be incorporated in the pricing of payment deferred vulnerable options. We assume that the underlying asset price follows a geometric Brownian motion, and employ the reduced form model to describe the default process of the option issuer. The research results show that the default risk of the option writer will further reduce the option value if the payment date is after the maturity date. Additionally, an interesting finding about the range accrual note is that the note value will not change monotonically with the volatility but will depend on whether the underlying price is within, outside, or on the range boundary. This is a special feature that the note writer has to focus on when hedging is conducted. In this work, we assume an independent relationship between the underlying asset price and the option writer's default. This assumption is reasonable for a large and well-diversified option writer. In order to handle more general cases, we recommend that future studies should consider the correlation between the underlying asset price and the option writer's default.

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EQUITY AGENCY COSTS AND INTERNATIONALIZATION: THE EFFECT OF REVISED ACCOUNTING STANDARDS IN TAIWAN

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Hsin-Chiu Huang, Feng Chia University

ABSTRACT

This study investigates whether the equity agency problems of firms with foreign operations mitigate after 2005, when the revised accounting standards on consolidated financial statements were implemented in Taiwan. A sample of listed Taiwanese firms announcing security offerings from 2000 to 2008 were examined. The results weakly support the hypothesis that equity agency cost problems of Taiwanese multinational corporations improved after 2005. Thus, we suggest that the Taiwanese government further increase information transparency of multinational corporations in order to be consistent with International Accounting Standards and achieve lower equity agency costs.

JEL: F23, G32

KEYWORDS: agency costs, consolidated financial statements, internationalization, information transparency

INTRODUCTION

In Taiwan, according to the original statement of financial accounting standards (SFAS) No._7 issued in 1985, listed firms were required to prepare only annual consolidated financial reports. The consolidation requirements of affiliates were based on the 50% ownership threshold. Due to low frequencies of consolidated financial reports, investors received time-lagged information from firms. In addition, some excluded clauses of the original SFAS No._7 enabling firms to hide their subsidiary information.

As an increasing number of Taiwanese firms internationalize, equity agency problems may become more serious. This holds especially true for firms with foreign operations due to the difficulty of monitoring foreign subsidiaries. In order to improve financial transparency and quality to the public, the Accounting Research and Development Foundation in Taiwan issued the revised version of SFAS No._7 and implemented it in 2005. At the same time, the Financial Supervisory Commission in Taiwan issued a new regulation. The former required all subsidiaries to be included in consolidated financial statements, and modified or deleted exclusion clauses. The latter required semi-annual consolidated financial reports in addition to annual reports. Thus, the equity agency problems of multinational corporations (MNCs) are expected to have declined after the implementation of these two revised accounting standards on consolidated financial statements.

Using Taiwanese firms from 2000 to 2004 as sample, Chiang and Ko (2009) find that shareholder wealth effects of security offering announcements are unfavorable for higher equity agency costs, and especially unfavorable for higher equity agency costs of foreign-exposed multinational corporations (MNCs). This occurs because internationalization renders monitoring more difficult in comparison to domestic corporations (DCs). Therefore, it is appropriate to examine if the situation improved after the implementation of two revised accounting standards on consolidated financial statements in 2005.

This study investigates the effects of the two new rules on the equity agency costs of MNCs in Taiwan by

using Taiwanese listed firms issuing securities between 2000 and 2008. First, we use the event study methodology to compute the CARs (cumulative average abnormal returns) of firms with security offering announcements. Second, we run a multiple regression model in order to investigate the shareholder wealth effects of security offering announcements associated with the degree of internationalization and equity agency costs before and after implementations of the two new rules.

Our results show that shareholder wealth effects of equity offering announcements are unfavorable for the equity agency costs of firms with highly international operations from 2000 to 2008. However, the results weakly support the hypothesis that equity agency problems improved after 2005 when the two new rules were implemented. This may be because information disclosure is still insufficient. Thus, this study encourages governments to reconsider the contents of the two new rules and further increase the information disclosure of MNCs in order to release timely information and be consistent with the International Accounting Standards. In addition, MNCs should further increase their information transparency voluntarily in order to achieve lower equity agency costs and reduce information asymmetry, thereby reducing the cost of capital.

The framework of this study is organized as follows. Section 2 provides a literature review. Section 3 details on the data, variables, and methodologies. Section 4 presents the results and Section 5 provides the discussion. Finally, Section 6 concludes this study.

LITERATURE REVIEW

There are no equity agency costs in a 100% owner-managed firm. However, as a firm's ownership structure changes and ownership separates from control, managers may not act in the owners' best interests increasing equity agency problems (Berle and Means, 1932). Jensen and Meckling (1976) divide agency costs into three parts: monitoring costs, bonding costs and residual costs. Barnea, Haugen and Senbet (1981) identify other sources of agency costs including information asymmetry and second-best decision-making. Later, Jenson (1986) investigates agency problem due to free cash flows. While there has been much research on agency costs, most of them focus on the effect to DCs.

Several studies examine equity agency costs for MNCs. Hofstede (1980) surveys 100,000 employees of a large MNC distributed across forty national cultures. He finds that some national cultures show enormous potential for conflict between the values of parent and foreign subsidiary managers. According to Fosberg and Madura (1991), even if managers at MNC headquarters aim to maximize shareholder wealth, foreign subsidiary managers may not do so. Instead, foreign country characteristics such as geographic distance from the headquarters, language and culture differences complicate monitoring of foreign subsidiary managers. Riahi-Belkaoui and Picur (2001) indicate that complexity of operations increases the information gap and presents opportunities for MNCs to manipulate earnings.

Duru and Reeb (2002) provide evidence that forecasting earnings becomes more difficult when a firm becomes more geographically diversified. Wright, Madura, and Wiant (2002) demonstrate valuation effects associated with equity offering announcements are more negative for firms with higher degrees of international business, supporting the concept that agency costs are more pronounced for firms with higher degree of international business. Doukas and Pantzalis (2003) argue that MNCs are susceptible to higher agency costs. Chiang and Ko (2009) provide evidence that lower frequencies of consolidated financial statements also increase information asymmetries, especially for MNCs.

In addition, Hart (1995) provides evidence that one possible reason for agency problems results from the information asymmetry. Healy and Palepu (2001) indicate that disclosure generally improves transparency and thus reduces information problems. Jo and Kim (2007) demonstrate that firms with extensive disclosure are less likely to face information problems, leading to less earnings management

and better post-issue performance. According to Lee, Mande, and Son (2008), timely disclosures reduce information asymmetry between managers and shareholders as well as the associated monitoring costs. Aggarwal and Kyaw (2009) indicate that national transparency regimes are increasingly important factors in firm valuation and national financial development. In addition, Botosan (1997) finds that the cost of capital is negatively associated with the level of voluntary disclosure. Gietmann and Trombetta (2003) demonstrate that disclosure policy is important because it impacts the cost of external finance. According to Yu (2005), a firm's disclosure quality and transparency influence its credit spreads.

Some studies focus on the effects of consolidation financial statements. SFAS 94 (1987) in the US requires consolidation of all majority-owned subsidiaries, including those of non-homogeneous operations, large minority interests, or foreign locations. Comiskey, McEwen and Mulford (1987) find the market incorporates unconsolidated subsidiary's debt in its assessment of the parent's risk. Khurana (1991) demonstrates that the issuance of SFAS 94 was associated with significant negative excess returns and consistent with the cash-flow effects hypothesis. Harris, Lang and Moller (1997), using German listed firms as a sample, provide evidence that consolidated financial statements are more value relevant than unconsolidated statements. Abad et al. (2000), using Spanish data, also supports higher value relevance of consolidated information.

DATA AND METHODOLOGY

The sample of this study consists of 734 Taiwanese firms with bond offering announcements and 352 Taiwanese firms with equity offering announcements from 2000-2008, as shown in Table 1. The data were collected from the Taiwan Economic Journal databank (TEJ) and the website of the Taiwan Securities & Futures Information Center.

Table 1: Distribution of Samples by Year

Year	2000	2001	2002	2003	2004	2005	2006	2007	**2008**
Equity offerings	52	24	49	51	35	34	39	45	23
Bond offerings	64	62	121	167	149	37	50	50	34

Data Source: Taiwan Economic Journal Databank

The variables used in this study are described as followings: Degree of Internationalization (*FS, FA, NOC*). In this study, MNCs are defined as firms whose foreign sales ratio or foreign assets ratio is more than 10%, and all others are defined as DCs. Three proxies are used to measure the degree of internationalization: *FS*: foreign sales ratio = foreign sales/total sales, *FA*: foreign assets ratio = foreign assets /total assets, *NOC*: the numbers of countries in which a firm operates

Equity Agency Costs (AD). Following Ang, Col, and Lin (2000) and Fleming, Heaney, and McCosker (2005), we use the discretionary expense ratio to measure how effectively a firm controls operating expenses and captures the impact of agency costs such as excessive perquisite consumption. Discretionary expenses consist for all other operating expenses, and excluding corporate wages, salaries and other labor-related items, interest expense, rent, leasing and hiring expenses, purchases, depreciation and bad debts written off. *AD*: discretionary expenses ratio = discretionary expenses / total assets

Firm Size (size). Larger firms are likely to have more agency conflicts and need more monitoring. Thus, larger firms face greater agency costs (Jensen and Meckling, 1976). *Size*: firm size = log (total assets)

Capital Expenditure Ratio (cap). The capital expenditure ratio is an important factor for the growth of a firm and accounts for the possible influence of investments on ownership. Firms may spend too much on capital expenditures and the over-investments may increase agency costs (Griner and Gordon, 1995).

cap: capital expenditure ratio = capital expenditures / total assets.

Leverage Ratio (lev). According to Agrawal and Knoeber (1996), debt financing can induce monitoring by lenders, thereby reducing equity agency costs. Jensen and Meckling (1976) stress the importance of debt financing in limiting managerial discretion over the use of free cash flows. On the contrary, too many lenders would result in agency problems between lenders and owners, decreasing a firm's value. *lev*: leverage ratio = debts/total assets

Insider Ownership (in) According to Jensen and Meckling (1976), as the manager's equity ownership increases, managers and shareholders are likely to have the same goals and managers will not waste a firm's resources, therefore increasing a firm's value (the convergence of interest hypothesis). However, Jensen and Ruback (1983) argue that entrenched managers will destroy firm value by designing favorable compensation arrangements for themselves and retaining their jobs even if they should be replaced (the entrenchment hypothesis). *in*: insider ownership = the percent of shares owned by insiders

Blockholder Ownership (bh) and *Institutional Ownership (inst*). Agrawal and Mandelker (1990) provide evidence for the active monitoring hypothesis, suggesting that when equity ownership is concentrated among blockholders or institutions, it is more attractive for them to monitor firms and increase firm values. In Taiwan, blockholders are defined as those who own more than 10% of a firm's total shares outstanding. *bh*: blockholder ownership = the percent of shares owned by a blockholder. *inst*: institutional ownership = the percent of shares owned by institutional investors

Tables 2, panels A and B, present descriptive statistics and correlation matrix for bond and equity offering announcement samples, respectively. The descriptive statistics of the variables are not very different between the sample of bond and equity offerings. In addition, the correlation among variables is low, and multicollinearity does not appear to be a problem in the second stage of the multiple regression analysis.

A standard event study procedure was used to analyze cumulative average abnormal returns (CARs) associated with bond and equity offerings announcements. We utilized a market model to calculate abnormal returns for each firm using daily stock returns. With the announcement day defined as day 0, the OLS market model coefficients were estimated in a pre-announcement period (day -150 to day -26). The Taiwanese value-weighted stock index was used as a proxy for market returns. Then, abnormal returns were averaged across firms to calculate the average abnormal returns. The two-day CARs calculated from day -1 to day 0 were the sum of the average abnormal returns. Then, the test of significance was conducted using the standard Brown and Warner (1985) test statistic with the null hypothesis of no abnormal performance.

After calculating the CARs as the dependent variables, multiple regression analysis was conducted to explain stock market reactions to the announcement of security offerings (shareholder wealth effects) with particular attention paid to variables of internationalization, equity agency costs and interaction between the two. The four hypotheses are as follows. First, we investigate whether the shareholder wealth effects of security offering announcements are more unfavorable for MNCs than DCs after the two revised accounting standards on consolidated financial statements were implemented in 2005.

Hypothesis 1: The unfavorable shareholder wealth effects of the security offering announcements of MNCs were mitigated after 2005.

$$\begin{aligned} CAR = {} & \alpha + \beta_1(D) + \beta_2(SIZE) + \beta_3(CAP) + \beta_4(LEV) + \beta_5(IN) \\ & + \beta_6(BLOCK) + \beta_7(INST) + \beta_8(D * DE) + \varepsilon \end{aligned} \quad (1)$$

where D = 1 if MNCs and D = 0 if DCs; DE = 0 if time period is 2000 to 2004, while DE =1 if 2005 to

2008. Significantly negative β_8 means that the shareholder wealth effects of security offering announcements are unfavorable for MNCs after 2005. We expect that β_8 is not significantly negative.

Table 2: Descriptive statistics and correlation matrix of variables for firms with equity and bond offering announcements

	Mean	Standard Deviation	FAR	FSR	FNO	D	AD	SIZE	CAP	LEV	IN	BLOCK	INST
Panel A: equity offerings													
FAR	0.0933	0.1380	1.000										
FSR	0.5142	0.3813	0.4152	1.000									
FNO	1.872	1.8423	0.4499	0.6040	1.000								
D	0.7288	0.4465	0.3958	0.8174	0.5085	1.000							
AD	0.4054	2.7898	-0.0677	-0.1402	-0.0519	-0.1696	1.000						
SIZE	9.992	0.8233	-0.1720	-0.1380	0.0390	-0.2589	0.0115	1.000					
CAP	0.0911	0.1985	0.0109	0.0898	-0.0304	0.1968	-0.0391	-0.2204	1.000				
LEV	0.5311	0.2096	-0.3171	-0.3127	-0.3061	-0.3961	-0.0785	0.3530	0.0504	1.000			
IN	0.3868	0.2740	-0.0623	-0.3034	-0.1898	-0.2735	0.1378	0.1723	-0.0454	0.1774	1.000		
BLOCK	0.0245	0.0910	-0.0397	-0.1475	-0.1038	-0.2131	-0.0121	-0.0398	-0.0448	0.0196	-0.1502	1.000	
INST	0.3414	0.2340	-0.2142	-0.1632	-0.0964	-0.2474	-0.0050	0.5060	-0.2148	0.1399	0.4264	0.0810	1.000
Panel B: Bond Offerings													
FAR	0.1490	0.1877	1.000										
FSR	0.5597	0.3549	0.2012	1.000									
FNO	2.788	2.477	0.0642	0.0657	1.000								
D	0.8540	0.3544	0.3082	0.6511	0.1153	1.000							
AD	0.3286	2.5917	-0.0720	-0.1441	-0.0667	-0.2221	1.000						
SIZE	10.398	0.7831	-0.3037	-0.2609	0.1237	-0.3697	-0.0326	1.000					
CAP	0.1645	0.1815	-0.2050	-0.0970	0.0123	0.1996	-0.0740	0.1165	1.000				
LEV	0.4522	0.1818	-0.3393	-0.2723	-0.0806	-0.6286	-0.0470	0.3983	-0.2948	1.000			
IN	0.2209	0.1285	-0.1966	-0.1962	-0.0069	-0.3798	0.0281	0.1517	0.0241	0.2859	1.000		
BLOCK	0.0050	0.0238	-0.0153	0.0304	0.0775	-0.1025	-0.0215	0.0752	-0.0730	0.0636	-0.0142	1.000	
INST	0.4761	0.2124	-0.1201	-0.1592	0.0339	-0.2539	-0.0577	0.5893	-0.0123	0.1829	0.3837	0.0443	1.000

Note: FAR is the foreign assets ratio, FSR is the foreign sales ratio, FNO is the number of countries in which a firm operates, D is the dummy variable of internationalization (D=1 if MNCs, D=0 if DCs, MNCs are defined as firms whose foreign sales ratio or foreign assets ratio are more than 10%), AD is the discretionary expenses ratio, SIZE is the logarithm of total assets, CAP is the capital expenditure ratio, LEV is the leverage ratio, IN is the insider ownership, BLOCK is the blockholder ownership, and INST is the institutional ownership.

Second, we investigate if the shareholder wealth effects of security offering announcements are more

unfavorable for firms with higher degrees of international operations after the two revised accounting standards on consolidated financial statements were implemented in 2005.

Hypothesis 2: The unfavorable shareholder wealth effects of security offering announcements for firms with higher degrees of international operations were mitigated after 2005.

$$\begin{aligned} CAR = {} & \alpha + \beta_1(DOI) + \beta_2(SIZE) + \beta_3(CAP) + \beta_4(LEV) + \beta_5(IN) \\ & + \beta_6(BLOCK) + \beta_7(INST) + \beta_8(DOI * DE) + \varepsilon \end{aligned} \quad (2)$$

where DOI = FSR, FAR, FNO. If β_8 is significantly negative, then the shareholder wealth effects of security offering announcements are more unfavorable for highly foreign-exposed than less foreign-exposed MNCs after 2005. We expect that β_8 is not significantly negative.

Third, we investigate whether shareholder wealth effects of security offering announcements are more unfavorable for the equity agency costs of MNCs after the two revised accounting standards on consolidated financial statements were implemented in 2005.

Hypothesis 3: The unfavorable shareholder wealth effects of security offering announcements associated with the equity agency costs of MNCs decrease after 2005.

$$\begin{aligned} CAR = {} & \alpha + \beta_1 (AD) + \beta_2(AD * D) + \beta_3(SIZE) + \beta_4(CAP) + \beta_5(LEV) \\ & + \beta_6(IN) + \beta_7(BLOCK) + \beta_8(INST) + \beta_9(AD * D * DE) + \varepsilon \end{aligned} \quad (3)$$

If β_9 is significantly negative, then the shareholder wealth effects of security offering announcements are more unfavorable for the equity agency costs of MNCs than for those of DCs after 2005. We expect that β_9 is not significantly negative.

Fourth, we investigate if the shareholder wealth effects of security offering announcements are more unfavorable for equity agency costs of highly foreign-exposed firms after the two revised accounting standards on consolidated financial statements were implemented in 2005.

Hypothesis 4: The difference of shareholder wealth effects of the security offering announcements associated with the equity agency costs for highly foreign-exposed firms decrease after 2005.

$$\begin{aligned} CAR = {} & \alpha + \beta_1 (AD) + \beta_2(AD * DOI) + \beta_3(SIZE) + \beta_4(CAP) + \beta_5(LEV) \\ & + \beta_6(IN) + \beta_7(BLOCK) + \beta_8(INST) + \beta_9(AD * DOI * DE) + \varepsilon \end{aligned} \quad (4)$$

If β_9 is significantly negative, then the shareholder wealth effects of security offering announcements are more unfavorable for the equity agency costs of the highly foreign-exposed firms than for those of less foreign-exposed firms after 2005. We expect that β_9 is not significantly negative. Standard errors in the above models are corrected for autocorrelation and heteroscedasticity using the Newey-West method (1987).

RESULTS

We first present the results of equity offering announcements in Panel A of Table 3. As shown in Model 1, the coefficient of D is negative, and the coefficient of D*DE is weakly positive. The results indicate

that the shareholder wealth effects of equity offering announcements are unfavorable for MNCs from 2000 to 2008. However, the unfavorable degree improves a little after 2005. In Model 2, the coefficients of DOI (ie. FSR, FAR, FNO) are all negative, and the coefficients of DOI*DE are weakly positive. The results indicate that shareholder wealth effects of equity offering announcements are unfavorable for firms with highly international operations from 2000 to 2008. However, unfavorable degree improves a little after 2005. Thus, Hypotheses 1 and 2 are weakly supported.

In Model 3, the coefficients of AD*D is negative, and the coefficient of AD*D*DE is insignificantly positive. The results indicate that the shareholder wealth effects of equity offering announcements are unfavorable for the equity agency costs of MNCs from 2000 to 2008, and the equity agency problem does not worsen after 2005. In Model 4, the coefficients of AD*DOI (ie. AD*FAR, AD*FAR, AD*FNO) are all negative, and the coefficients of AD*DOI*DE are weakly positive. The results indicate that the shareholder wealth effects of equity offering announcements are unfavorable for equity agency costs of firms with highly international operations from 2000 to 2008. However, equity agency problems improve a little after 2005. Thus, Hypotheses 3 and 4 are weakly supported. With regard to the control variables, the coefficients of firm size and blockholder are positive. All other variables are found to be insignificant, indicating that insiders, bondholders, and institutions are inefficient monitors.

We then present the results for bond offering announcements in Panel B of Table 3. As shown in Model 1, the coefficient of D is negative, and the coefficient of D*DE is significantly positive. The results indicate that the shareholder wealth effects of equity offering announcements are unfavorable for MNCs from 2000 to 2008. However, the unfavorable degree improves after 2005. In Model 2, the coefficients of DOI (ie. FSR, FAR, FNO) are all negative, and the coefficients of DOI*DE are weakly positive. The results indicate shareholder wealth effects of equity offering announcements are unfavorable for firms with highly international operations from 2000 to 2008. However, the unfavorable degree improves a little after 2005. Thus, Hypotheses 1 and 2 are weakly supported.

In Model 3, the coefficients of AD*D is negative, and the coefficient of AD*D*DE is weakly positive. The results indicate the shareholder wealth effects of equity offering announcements are unfavorable for equity agency costs of MNCs from 2000 to 2008, and equity agency problems improve a little after 2005. In Model 4, the coefficients of AD*DOI (ie. AD*FAR, AD*FAR, AD*FNO) are all negative, and the coefficients of AD*DOI*DE are weakly positive. The results indicate that shareholder wealth effects of equity offering announcements are unfavorable for equity agency costs of firms with highly international operations from 2000 to 2008. However, equity agency problems improve a little after 2005. Thus, Hypotheses 3 and 4 are weakly supported. With regard to the control variables, the coefficient of firm size is positive. All other variables are insignificant, indicating that insiders, bondholders, blockholders and institutions are inefficient monitors.

DISCUSSION

The results above demonstrate that problems regarding the equity agency costs of Taiwanese MNCs declined only slightly after the implementation of the two new rules in 2005. Therefore, investors should still consider information asymmetry to some extent. This result may be due to the fact that the information disclosure is still insufficient.

Based on the empirical results this study suggests that Taiwanese governments reconsider the content of the two new rules and further increase the information disclosure of MNCs in order to release more timely information and to be consistent with the International Accounting Standards. In addition, we suggest that MNCs further increase their information transparency voluntarily in order to achieve lower equity agency costs and help investors monitor management, thereby reducing information asymmetry and the cost of capital. For example, MNCs can announce quarterly consolidated financial statements

voluntarily or release earnings reports sooner than the mandatory date.

Table 3: The Results of Equity and Bond Offering Announcement

CAR	Model 1 D	Model 2.1 FSR	Model 2.2 FAR	Model 2.3 FNO	Model 3 AD*D	Model 4.1 AD*FSR	Model 4.2 AD*FAR	Model 4.3 AD*FNO
Panel A: Equity Offerings								
Intercept	-1.289	0.5872	0.0127	0.0828*	-1.3937	-1.4387	-1.2586	-1.0685
	(-1.061)	(0.7661)	(0.2098)	(-1.800)	(-1.110)	(-1.168)	(-1.022)	(-0.862)
D/DOI	**-0.6848***	-0.3612	**-2.105***	**-2.215***				
	(-1.9961)	(-1.2611)	(-1.8356)	(-1.9213)				
AD					**-1.086***	-0.1223	**-1.182***	**-0.1971***
					(-1.952)	(-1.287)	(-2.400)	(-2.495)
AD*D/AD*DOI					**-2.102*****	**-1.919***	**-2.212****	**-2.010****
					(-2.924)	(-1.824)	(-2.440)	(-2.949)
SIZE	0.1763	**0.2070***	0.1873	**0.1953***	**0.2304***	**0.2200***	**0.1968***	0.1815
	(1.404)	(1.653)	(1.484)	(1.844)	(1.943)	(1.839)	(1.684)	(1.508)
CAP	0.8457	0.7204	0.715	0.6972	0.8969	0.7837	0.8323	0.8198
	(1.460)	(1.240)	(1.199)	(1.156)	(1.5141)	(1.318)	(1.418)	(1.355)
LEV	-0.1517	0.0983	0.3393	0.3048	-0.2527	-0.0848	0.033	0.0308
	(-0.3177)	(0.1951)	(0.6563)	(0.5949)	(-0.5111)	(-0.163)	(0.0607)	(0.059)
IN	0.1915	0.3659	0.4539	0.4364	0.1549	0.1874	0.2122	0.2453
	(0.5043)	(0.9562)	(1.185)	(1.137)	(0.346)	(0.4164)	(0.5306)	(0.5946)
BLOCK	**2.847****	**3.371*****	**3.469*****	**3.502*****	**2.910*****	**3.210*****	**3.244*****	**3.397*****
	(2.552)	(2.852)	(2.887)	(2.900)	(2.764)	(2.911)	(2.867)	(3.065)
INST	-0.5635	-0.5333	-0.4843	-0.4835	-0.4624	-0.3742	-0.3334	-0.2728
	(-1.105)	(-1.029)	(-0.9383)	(-0.9234)	(-0.8533)	(-0.6835)	(-0.6312)	(-0.5016)
D*DE/DOI*DE	**0.3467***	0.3882	**1.045***	**1.048***				
	(1.901)	(1.473)	(1.651)	(1.690)				
AD*D*DE/AD*DOI*DE					0.0339	0.0845	**0.104***	**0.103***
					(0.4499)	(1.379)	(1.765)	(1.807)
Adjusted R^2	0.0412	0.0207	0.0156	0.0166	0.0361	0.0214	0.0259	0.0241
F-value	**1.763***	**1.867***	**1.649***	**1.690***	**2.229****	**1.717***	**1.873***	**1.811***
Panel B: Bond Offerings								
Intercept	-0.028	**1.748***	1.700	1.390	1.805	1.441	1.367	1.067
	(-1.161)	(1.792)	(1.445)	(1.241)	(1.551)	(1.483)	(1.178	(0.9521)
D/DOI	**-1.371****	**-1.370***	**-1.593***	**-2.295***				
	(-2.036)	(-2.273)	(-1.810)	(-1.858)				
AD					**-1.251***	**-1.199***	-0.3156	-0.2656
					(-1.948)	(-1.883)	(-3.039)	(-0.176)
AD*D/AD*DOI					**-1.041***	**-1.064***	**-1.116****	**-1.462****
					(-1.753)	(-1.841)	(-2.406)	(-2.780)
SIZE	**0.2091***	**0.1613***	0.1832	**0.152***	0.0245	**0.1663***	0.0302	**0.1861***
	(1.958)	(1.722)	(1.561)	(1.824)	(0.1799)	(1.920)	(0.2275)	(1.895)
CAP	0.2513	-0.1633	0.1375	0.2117	0.2663	0.0211	0.1493	0.1539
	(0.5732)	(-0.5309)	(0.354)	(0.5471)	(0.6067)	(0.064)	(0.3424)	(0.3752)
LEV	0.5142	0.4310	0.6773	0.6853	0.5332	0.5218	0.8102	0.733
	(1.153)	(1.221)	(1.502)	(1.566)	(1.1456)	(1.383)	(1.652)	(1.627)
IN	-0.6506	-0.6248	-0.4911	-0.5013	-0.5518	-0.6367	-0.3949	-0.5177
	(-1.132)	(-1.238)	(-0.9087)	(-0.9303)	(-0.9401)	(-1.2306)	(-0.7283)	(-0.9666)
BLOCK	1.402	0.9186	1.000	1.084	**1.114***	0.8871	-0.8408	0.9726
	(1.272)	(0.9724)	(0.9667)	(1.038)	(1.9947)	(0.8973)	(-0.7842)	(0.8905)
INST	0.0466	-0.0632	0.0428	0.0588	-0.0411	-0.072	-0.0434	0.0518
	(0.1167)	(-0.1703)	(0.11)	(0.1508)	(-0.1024)	(-0.1913)	(-0.1094)	(0.1339)
D*DE/DOI*DE	**1.367***	0.8432	**1.001***	0.1057				
	(1.860)	(1.235)	(1.823)	(0.5889)				
AD*D*DE/AD*DOI*DE					**0.9312***	0.0542	**0.9508***	0.1484
					(1.979)	(1.233)	(1.907)	(1.145)
Adjusted R^2	0.0323	0.0284	0.0402	0.0226	0.0676	0.0862	0.0268	0.0357
F-value	**1.923***	**1.803***	**1.981***	**1.769***	**1.735***	**1.973***	**1.774***	**1.896***

*D is MNC dummy, D =1 if MNCs, D=0 if DCs; DOI is degree of internationalization, including FSR(foreign sales ratio), FAR(foreign assets ratio), and FNO(the numbers of countries where a firm operates); AD is agency cost; SIZE is firm size; CAP is capital expenditure ratio; LEV is leverage; IN is insider ownership; BLOCK is blockholder ownerwhip; INST is institutional ownership; DE is time period dummy, DE =1 if 2005 to 2008. *; **; *** indicates significance at the 0.1, 0.5, and 0.01. The figure in the ( ) is the t-value .*

In this study, insiders, bondholders and institutions are found to be inefficient monitors. Khurana, Pereira, and Martin (2006) note that disclosure plays a governance role in improving investors' ability to monitor and better evaluate managerial performance. Lee, Mande, and Son (2008) indicate that greater complexity of MNC operations decreases the ability of the board of directors to monitor management effectively. Thus, further information transparency provides more incentives for them to be efficient monitors.

CONCLUSION

This study examines the effect of the revised accounting standards on consolidated financial statements using a sample of listed Taiwanese firms announcing security offerings from 2000 to 2008. Our results weakly support the hypothesis that the equity agency costs problems of MNCs declined after implementation of the revised accounting standards on consolidated financial statements. Thus, this study encourages governments to reconsider the content of the two new rules and further increase the information disclosure requirements of MNCs. In addition, MNCs are suggested to further increase their information transparency in order to achieve lower equity agency costs and help reduce information asymmetry, thereby enabling firms to raise capital on the best available terms.

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ASSET GROWTH AND FIRM PERFORMANCE EVIDENCE FROM GREECE

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ABSTRACT

This study provides evidence drawn from publicly traded companies in Greece on the predictability of assets growth with respect to firm performance. We employ discriminant analysis and a logit specification to test our models. Results indicate that assets growth is predictable at an 85.7% rate in large companies. This rate is high compared those in other prediction studies such as bankruptcy, qualified audit reports and going-concern opinions.

JEL: M,M41

KEYWORDS: asset growth, firm performance, discriminant analysis, logit

INTRODUCTION

Assets are the economic resources of a company expected to benefit the firm's future operations. Certain kinds of assets including cash and accounts receivable are monetary items. Others like inventory, land, buildings and equipment are nonmonetary, physical items. Still other assets like patents, trademarks, and copyrights-are non-physical. The assets of a business enterprise are an integral part of business operations. Assets work in conjunction with other components of liabilities and equity in the overall business operations. Stock returns are a high priority measure of performance. However, prior studies show the market is slow to incorporate publicly available information, contrasting the efficient market hypotheses. Sales and earnings growth are also important measures of performance. Growth provides additional capabilities, opportunities, revenue and profit. Growth can be organic or from mergers and acquisitions.

The purpose of this study is to highlight differences between companies with positive versus negative asset growth. Using firm performance financial ratios as predictors it is shown that assets growth can be predicted at an 85.7% rate in large companies using discriminant analysis. Logit specifications produce a lower predictability. The prediction rates here are high compared to other prediction studies such as bankruptcy, corporate acquisitions, qualified audit reports and going-concern opinions. The contribution of this study is two-fold. First, it provides empirical evidence with a test of two prediction models in a new area of research. Second it adds a firm based analysis in a research area which has previously been examined primarily at the macroeconomic level. The remainder of the paper is organized as follows: Section 2 provides a review of the literature. Section 3 describes the research design. Section 4 presents the empirical analysis and results. Section 5 provides some concluding comments and suggestions for further future research.

LITERATURE REVIEW

Prior studies in this area have focused on decomposition of stock returns, disaggregation of growth in net operating assets, post-acquisition returns, the impact of R & D increases, capital investments, stock returns, and predictability of stock returns based on balance-sheet growth. In an effort to identify the information that moves stock prices, Campbell (1991) decomposes stock returns into a component that reflects information about cash flows, and a component that reflects information about discount rates.

Lakonishok et al (1994) presented evidence that investors over-react to past sales growth rates. Ohlson et al (1995) and Feltham and Ohlson (1995) show that growth in net operating assets as well as current profitability affect future profitability and firm value. Research finds differential persistence of the cash flow and accrual components of earnings for one-year-ahead ROA (Sloan, 1996).

Fairfield et al (2003) disaggregated growth in net operating assets into accruals and growth in long-term operating assets. They found that both components of growth in net operating assets are negatively associated with one-year-ahead return on assets. Whether growth is in current or long-term net operating assets it has been found that the market's apparent mispricing of accruals relates to investors inability to correctly assess the implications of growth in net operating assets for future profitability. Loughran and Vijh (1997) examine 947 acquisitions from 1970-1989. They investigated post-acquisition returns in the context of shareholders wealth gains. They found a relationship between post-acquisition returns and the mode of acquisition. Firms that complete stock mergers during a five-year period following the acquisition earn on average negative excess returns of -25%. However, firms that complete cash tender offers earn positive excess returns of 61.7%. Their results also indicate that when the acquisition succeeds the gains from stock mergers tend to be dispersed within five years. According to Franks et al (1991) there are no significant abnormal returns over a three-year period after the last bid date. Agrawal et al. (1992) found that mergers are followed by significant abnormal returns of -10.0% over a five-year period after the effective date but tender offers are not.

Ikenberry et al (1995) showed that firms buying back their stock over-perform for a period of five years. Bradley et al (1983) showed that abnormal gains realized by target companies after the announcement of a tender offer disappear if the bid does not succeed and no subsequent bid materializes within five years. Asquith (1983) found that the announcement of an unsuccessful merger bid generates an immediate increase in the price of target shares but the entire gain disappears within a year after bid termination.

Eberhart et al (2004) examined a sample of 8,313 cases where firms unexpectedly increase their R&D investments by an economically significant amount between 1951 and 2001. This study offers several notable insights that contrast previous studies. The most important reasons for increasing R&D are the following: i) R&D increases differ from other attributes because they represent a managerial decision, ii) these increases differ from events such as stock repurchases because there is no formal announcement by managers, iii) these increases represent investment decisions, not financing decisions. Arguments that R&D investments are different from other long-term investments are the following: i) the cost of an R&D investment is more clearly tangible because its accounting treatment is as an expense and not capitalized, ii) the potential benefit of an R&D increase reflects intangible information about future cash flows.

The difference between tangible and intangible information has been examined by Daniel and Titman (2006) who argued that investors react inappropriately to intangible information but not to tangible information. Eberhart et al (2004) found consistent evidence that R&D increases affect shareholders experience implying significantly positive long-term abnormal stock returns follow. Almost the same happens to firms which experience significantly positive abnormal operating performance. The conclusion is that the market does not quickly recognize the value of R&D investments. These authors also classified firms into high-tech, low-tech, high-growth, and low-growth firms and thus investigated whether their findings differ across certain groups of firms. The results indicate that R&D increases positively affect all four categories of firms. Their evidence suggests that high-tech firms exhibit better abnormal operating performance than low-tech firms. Chan et al (1990) find high-tech firms make R&D investments which are likely to be more beneficial than in other groups of firms.

Szewczyk et al (1996) found that there are firms with better investment opportunities. They could be high-growth firms with market-to-book ratios greater than unity. These firms are more likely to make better R&D investments. Titman et al (2004) investigated whether investor's under-react to empire

building implications of increased investment expenditures. They found that firms that increase their investment expenditures the most tend to under-perform their benchmarks over the following five years. The second half of the 1980's decade was the period in which empire builders were subject to hostile takeovers. There is no relation between returns and abnormal capital in the 1984 to 1989 period. With regard to capital expenditures it has been found that although firms tend to invest more following increases in their stock prices, cash flows tend to be the best predictor of a firm's investment expenditures (Fazzari et al (1988); Morck et al (1990)).

McConnell and Muscarells (1985) argued that when major capital investments are announced stock prices tend to respond favourably. On the other hand, Loughran and Ritter (1995) found that firms with financing choices associated with increased investment such as equity issuances generally experience negative stock returns. On the contrary, firms with choices associated with decreased investment, such as repurchases, generally experience positive returns (Ikenberry et al, 1995). According to Daniel and Titman (2006) the information that a firm presents in its financial statements is its past and current performance. This is tangible information. All other information is intangible information. The above mentioned authors found the cross-sectional relation between past performance measures and future stock returns is not significant. Rather, they found that book-to-market and reversal effects arise because future returns are cross-sectionally related to past realizations of intangible information. That is to say a component of past returns that can not be explained by tangible information about past performance.

Chan et al (2010) examined several hypotheses about the predictability of stock returns based on balance-sheet growth. The hypotheses are related to: the long-run under-performance of acquirers after mergers; investors extrapolation of past growth; over-expansion by managers due to agency costs and under-performance following equity market timing by managers. They found adverse consequences of asset expansion are aggravated in cases where predictability is low, or corporate governance is weak. When asset growth is primarily in the form of cash accumulation, the negative returns are mitigated.

DATA AND METHODOLOGY

Prior studies employ a variety of methodologies. A sample of 265 firms listed on the Athens Stock Exchange(ASE) were selected for investigation in this study. The sample size is based on the number of firms that appeared on the Internet in 2009. Only firms that had data for the year 2008 were selected to facilitate computation of asset growth. Of the 265 firms in the sample, one hundred six firms had positive asset growth 159 had negative asset growth.

Discriminant analysis and Logit models are employed in this study. Discriminant analysis and Logistic regression examine the power of explanatory variables to predict whether individual cases are drawn from one or another of two populations. For both types of analysis, Y is an indicator variable representing the type of assets growth, with Y=1 if the firm has positive asset growth and Y=0 otherwise. The predictor variables, denoted by a row vector x, include eleven financial ratios for the firm. The two types of analysis are closely related, as will be shown below. Type of asset growth is the dependent variable and eleven financial ratios were used as independent variables.

Our model for discriminant analysis assumes that predictor vector x is drawn from one of two multivariate normal distributions corresponding to firms with Y=1 and Y=0, respectively. The research hypothesis postulates that the two populations have different means but the same covariance matrix. A linear discriminant function w= a + xb is formed as a linear combination of the predictor variables. Here a is an intercept and b is a column vector of discriminant coefficients. Because x is assumed to be multivariate normal, the linear discriminant value w is also normally distributed. Under the research hypothesis, the normal distributions for Y=1 and Y=0 have different means but a common variance. Both a and b are estimated from the data in such a way that the statistical distance or separation of the Y=1 and

Y=0 samples on the linear discriminant scale is as large as possible. Results of this estimation procedure and an assessment of the discriminating power of the predictor variables are shown in Section 3.
Logistic regression considers the probability P(Y=1|x) that a firm with predictor vector x will have positive asset growth. For brevity, we let p=P(Y=1|x). By definition, the probability that the firm will not have positive asset growth is 1-p=P(Y=0|x). The logistic regression model assumes that the log-odds of event Y=1 is the following linear combination of the predictor variables:

$$\log\left[\frac{p}{1-p}\right] = c + xd \quad (1)$$

Here p/(1-p) denotes the odds in favor of Y=1, c is an intercept term, and d is a vector of regression coefficients estimated from the data using the maximum likelihood method. The model estimation attempts to associate large probabilities p with firms for which Y=1 and small probabilities p with firms for which Y=0. Results of this estimation procedure and tests of whether the predictor variables successfully classify firms from the two populations are given in Section 3.

The strict statistical assumptions for the analysis established by Palepu (1986), Karels and Prakash (1987); and Maddala (1991) are: (1) equal probability distributed between the two groups of companies and the efficiency of each model using different data; (2) further statistical implications related to the unequal sampling rates and, (3) the stability of discrete models overtime.

Variables that reflect profitability and activity ratios were selected for this study representing firm performance. These variables are used as predictors in the prediction models and as discriminating factors between the two groups of companies (those with a positive asset growth and those with negative asset growth). The four predictors are: Net Income/Total Assets (NITA) which indicates the profitability of assets. Sales/Total Assets (SATA) indicates how efficiently a company uses its assets to produce income. Net Income/Sales (NISA) indicates the percentage of sales that contributes to net income. Net Income/Equity (NIEQ) indicates the profitability of the owners investment. Receivables/Sales (RECSA) indicates the percentage of sales that are made on account.

The probability of asset growth is conditional on five independent variables identified above using discriminant analysis or a Logit specification on our i) full sample, ii) sample with large companies and, iii) sample with small companies. The estimated model is:

$$Prob\ of\ Asset\ Growth = \beta_0 + \beta_1 NITA + \beta_2 SATA + \beta_3 NISA + \beta_4 NIEQ + \beta_5 RECSA + \varepsilon_i \quad (2)$$

Prob of Asset Growth takes on the value of 1 if firm i has a positive asset growth and 0 if firm i has a negative asset growth. B_0, B_1, B_2 and so on are parameters to be estimated. ε_i is a random disturbance term.

The full sample was segregated into two groups, a sample of large companies and a sample of small companies based on the mean of assets of all firms. The average mean assets is 2,644,873.98 euro. The maximum value of assets is 113,394,000 and the minimum is 3,908 euro.

EMPIRICAL ANALYSIS AND RESULTS

The means of each variable used in the analysis are illustrative of the differences between groups of companies. Table 1 indicates the average means of each variable/ predictor and their significance. Differences between the positive and negative asset growth groups of companies are focused in SATA (Sales/Total Assets) and RECSA (Receivables/Sales) when all data are used. However, when outliers are

excluded there are no large differences. Average ratio differences are significant for NITA (Net Income/Total Assets), NISA (Net Income/Sales) and NIEQ (Net Income/Equity).

Table 1: Mean Average Ratios

	Full Sample			**Outliers Excluded**		
	Positive Change	Negative Change	Significance	Positive Change	Negative Change	Significance
NITA	0.0002	-0.030	0.000***	0.016	-0.030	0.000***
SATA	0.749	229.763	0.103	0.756	0.595	0.147
NISA	0.000	-0.000	0.000***	0.000	-0.000	0.000***
NIEQ	0.000	-0.000	0.000***	0.000	-0.000	0.000***
RECSA	22.589	1.718	0.457	1.474	1.036	0.587

*This table shows the mean levels of the variables used in the analysis. The first column indicates the mean of companies with positive asset growth, the second column indicates the mean of the companies with negative asset growth. The third column reports significance. The first three columns refer to the full sample. The next three columns have the same meaning with outliers excluded. ***, ** and * indicate significance at the 1, 10 and 5 percent levels respectively.*

It is important to test for normality because outliers may have a large influence on the results. The Kolmogorov-Smirnov technique is an appropriate normality test statistic. Prior studies have shown that non-normally distributed financial ratios are characterized by the presence of outliers. The data here has only one outlier for the variable SATA (sales/Total Assets) and five outliers in the variable RECSA (Receivables/Sales). The number of outliers is small relative to other studies that examine the distributional properties of financial ratios (Deakin,1976; So,1987;Karels and Prakash,1987). Table 2 reports Kolmogorov-Smirnov statistics that indicate normality of the variables. Almost all variables are not normally distributed.

Table 2: Normality Test (Kolmogorov-Smirnov)

	Full Sample		**Outliers Excluded**	
	Positive Change	Negative Change	Positive Change	Negative Change
NITA	1.542(0.017**)	3.210(0.000***)	1.542(0.017**)	3.210(0.000***)
SATA	3.548(0.000***)	6.618(0.000***)	3.448(0.000***)	1.593(0.012**)
NISA	4.984(0.000***)	6.156(0.000***)	4.984(0.000***)	6.156(0.000***)
NIEQ	2.992(0.000***)	5.490(0.000***)	2.995(0.000***)	5.490(0.000***)
RECSA	4.987(0.000***)	5.429(0.000***)	3.824(0.000***)	4.690(0.000***)

This table indicates Kolmogorov-Smirnov z-statistic for companies with positive asset growth and companies with negative asset growth for the full sample and with outliers excluded. Numbers in parenthesis indicates two tails significance

Coefficients for each model and for each variable using the full sample are given in Table 3. The results for discriminant analysis are presented in Panel A. The results for Logit analysis are presented in Panel B. The best fitting model is identified through an examination of all empirical findings drawn from tests of discriminant and logit analysis. Wilks' Lambda is one of several statistics available to test the significance of the discriminant function as a whole. The significant Lambda shown in Table 3 indicates that the null hypothesis that the two groups have the same mean discriminant function scores, is rejected and we conclude that the model is discriminating. In discriminant analysis almost all variables contribute marginally. In this case, NITA (Net Income/Total Assets), NIEQ (Net Income/Equity) and RECSA (Receivables/Sales) are positively related with asset growth while SATA (Sales/Total Assets) and NISA (Net Income/Sales) have a negative relationship with asset growth. When outliers are excluded only NISA(Net Income/Sales) has a negative relationship with asset growth. In the Logit analysis one variable, Net Income/Equity, contributes heavily. When outliers are excluded variables NISA (Net Income/Sales) and NIEQ (Net Income/Equity) contribute tremendously. NISA(Net Income/ Sales) is the only variable which has a negative relationship with assets growth in both the full and restricted samples.

Table 3: Regression Coefficients

Panel A: Discriminant Analysis

	Full Sample		**Outliers Excluded**	
Variable	**Predicted Sign**	**Coefficient**	**Predicted Sign**	**Coefficient**
NITA	+	1.290	+	1.127
SATA	-	0.588	+	0.331
NISA	-	0.680	-	0.405
NIEQ	+	0.107	+	0.098
RECSA	+	0.456	+	0.616
EIGENVALUE	0.037		0.044	
CORRELATION	0.189		0.206	
WILK'S LAMBDA	0.964		0.957	
X^2	9.287		10.885	
SIGNIFICANCE	0.098*		0.054*	
OBSERVATIONS	529		529	
VALID	261		255	

Panel B: Logit Analysis

	Full Sample			**Outliers Excluded**		
Variable	Predicted Sign	Coefficient	p-value	Predicted Sign	Coefficient	p-value
NITA	+	4.272	0.027**	+	4.170	0.034**
SATA	+	0.000	0.887	+	0.116	0.393
NISA	-	160.87	0.933	-	137.94	0.690
NIEQ	+	489.48	0.709	+	463.91	0.718
RECSA	+	0.017	0.384	+	0.087	0.072*
X^2	12.176			12.078		
SIGNIFICANCE	0.032**			0.034**		
WALD TEST	9.836			10.061		
NAGELKERKE R2	0.062			0.062		
OBSERVATIONS	529			529		
VALID	261			255		

*This table shows the regression estimates of the model. Prob of asset growth=b0+b1(NITA)+b2(SATA) +b3(NISA)+b4(NIEQ)+b5(RECSA+ei). The first column indicates the predicted sign, the second column reports regression coefficients and the third column indicates p-values with the full sample and with outliers excluded. Several other statistics are given along with the number of observations. Panel A provides all these statistics using discriminant analysis while Panel B provides corresponding statistics using a logit specification. ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.*

Coefficients for each model and variable using the sample of large companies are given in Table 4. The moderate value of Wilk's Lambda shown in Table 4 indicates the two groups have the same mean discriminant function scores and we conclude that the model is moderately discriminating. NITA (Net Income/Total Assets), NIEQ (Net Income/Equity), NISA (Net Income/Sales), and RECSA (Receivables/Sales) each have a positive relationship with asset growth while SATA (Sales/Total Assets) has a negative relationship with asset growth. When outliers are excluded only NIEQ (Net

Income/Equity) has a negative relationship with asset growth. In the logit analysis one variable contributes to the discrimination (Net Income/ Assets). When outliers are excluded the picture does not change significantly.

Table 4: Regression Coefficients for Large Company Sample

Panel A: Discriminant Analysis

	Full Sample		Outliers Excluded	
Variable	**Predicted Sign**	**Coefficient**	**Predicted Sign**	**Coefficient**
NITA	+	0.063	+	0.395
SATA	-	0.819	+	0.857
NISA	+	0.045	+	0.967
NIEQ	+	0.976	-	0.206
RECSA	+	0.209	+	0.082
EIGENVALUE		0.430	0.258	
CORRELATION		0.548	0.453	
WILK'S LAMBDA		0.699	0.795	
X^2		5.899	2.867	
SIGNIFICANCE		0.316	0.720	
OBSERVATIONS		45	37	
VALID		21	17	

Panel B: Logit Analysis

	Full Sample			Outliers Excluded		
Variable	**Predicted Sign**	**Coefficient**	**p-value**	**Predicted Sign**	**Coefficient**	**p-value**
NITA	+	28.516	0.029**	+	4.891	0.875
SATA	-	2.892	0.227	-	2.033	0.409
NISA						
NIEQ						
RECSA	+	0.002	0.989	-	0.066	0.661
X^2	3.046			0.721		
SIGNIFICANCE	0.023**			0.868		
WALD TEST	5.154			4.249		
NAGELKERKE R2	0.203			0.063		
OBSERVATIONS	45			37		
VALID	21			17		

*This table shows the regression estimates of the model Prob of asset growth=b0+b1(NITA)+b2(SATA) +b3(NISA)+b4(NIEQ)+b5(RECSA+ei). estimated using the large firm sample. The first column indicates the predicted sign the second column reports regression coefficients and the third column indicates p-values. Several other statistics are given along with the number of observations. Panel A provides statistics using discriminant analysis while Panel B provides corresponding statistics using a logit specification. ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.*

Coefficients for each model and for each variable using the sample of small firms are given in Table 5. The significant Lambda shown in Table 5 is similar to the full sample indicating that the null hypothesis

that the two groups have the same mean discriminant function scores is rejected and we conclude that the model is discriminating.

Table 5: Regression Coefficients for Small Company Sample

Panel A: Discriminant Analysis

	Full Sample		**Outliers Excluded**	
Variable	**Predicted Sign**	**Coefficient**	**Predicted Sign**	**Coefficient**
NITA	+	1.279	+	0.802
SATA	-	0.580	+	0.475
NISA	-	0.676	-	0.191
NIEQ	+	0.105	+	0.124
RECSA	+	0.478	+	0.054
EIGENVALUE	0.036		0.032	
CORRELATION	0.188		0.177	
WILK'S LAMBDA	0.965		0.969	
X^2	8.401		7.305	
SIGNIFICANCE	0.135		0.199	
OBSERVATIONS	486		486	
VALID	239		234	

Panel B: Logit Analysis

	Full Sample			**Outliers Excluded**		
Variable	**Predicted Sign**	**Coefficient**	**p-value**	**Predicted Sign**	**Coefficient**	**p-value**
NITA	+	3.788	0.047**	+	3.560	0.071
SATA	+	0.000	0.866	+	0.150	0.300
NISA	+	54.009	0.974	-	1333.78	0.594
NIEQ	+	450.66	0.732	+	471.61	0.721
RECSA	+	0.002	0.613	+	0.016	0.852
X^2	9.952			7.847		
SIGNIFICANCE	0.077			0.165		
WALD TEST	16.209			15.037		
NAGELKERKE R2	0.056			0.045		
OBSERVATIONS	486			486		
VALID	239			234		

*This table shows the regression estimates of the model: Prob of assetsgrowth)=b0+b1(NITA)+b2(SATA) +b3(NISA)+b4(NIEQ)+b5(RECSA) + ei. The analysis is completed using the sample of small firms. The first column indicates the predicted sign, the second column reports regression coefficients and the third column indicates p-value. Several other statistics are provided along with the number of observations. Panel A provides all the statistics using discriminant analysis while Panel B provides corresponding statistics using a logit specification. ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.*

NITA (Net Income/Total Assets), NIEQ (Net Income/Equity) and RECSA (Receivables/Sales) are positively related with asset growth while SATA(Sales/Total Assets) and NISA(Net Income/Sales) have a negative relationship with asset growth. This is the same effect as found in the full sample. When outliers are excluded only NISA (Net Income/Sales) has a negative relationship with asset growth. In the logit

analysis two variables contribute adequately: NIEQ (Net Income/Equity) and NISA (Net Income/Sales). When outliers are excluded variables NISA (Net Income/Sales) and NIEQ (Net Income/Equity) contribute heavily. NISA (Net Income/ Sales) is the only variable with a negative relationship with asset growth either using all data or with outliers excluded.

Summarizing the results we note that discriminant analysis provides similar results in the full sample and two sub samples. On the other hand, using Logit we see that the full sample and the sample of large companies more closely resemble each other. Once the discriminant analysis coefficients are estimated, it is possible to calculate discriminant scores for each observation in the sample, or any firm, and to assign the observations to one of the groups based on this score. The essence of the procedure is to compare the profile of an individual firm with that of the alternative groupings. The firm is assigned to the group it most closely resembles.

Results offered in next Table 6 indicate a preference to discriminant analysis for the full sample or the sample of large companies. The picture is different using logit. The rate of prediction accuracy in the full sample is 65.9% with discriminant analysis and 58.2% with logit. When outliers are excluded the rates are 65.1% and 61.6%, respectively. Using the large company sample the rate is 85.7 % using discriminant analysis and 76.2 % using logit. When outliers are excluded the rates are 76.5% and 70.6% respectively. Using the small company sample the rate is 66.5 % for discriminant analysis and 61.9 % for logit. When outliers are excluded the rates are 61.5% and 63.7% respectively.

In Panel A, the first number in the first row for the full sample indicates the number (and percentage) of companies of the positive growth group correctly classified into this group. The second number (and percentage) indicates the number of companies in the positive growth group that have been misclassified into the negative growth group. The first number (and percentage) in the second row of the full sample indicates the number of companies of the negative growth group that have been misclassified into the positive growth group and the second number (and percentage) indicates the number of companies of the negative growth group that have been correctly classified. The same interpretation applies to the logit case in Panel A and to the remaining Panels B and C.

Based on the above empirical findings the prediction accuracy of asset growth in large companies is high (85.7 %) compared to corresponding rates in other business events like prediction of bankruptcy, corporate acquisitions and audit reports. Even the lower rates in this study are comparable with other studies.

CONCLUSIONS AND SUGGESTIONS FOR FURTHER FUTURE RESEARCH

This study purports to discriminate companies with positive asset growth from companies with negative asset growth. Using discriminant analysis and a logit specification with firm's performance financial ratios as predictors we are able to predict the direction of asset growth with accuracy above 85.0 % in large companies. These findings clearly indicate that asset growth can be predicted and the models are discriminating. From a statistical point of view, discriminant analysis performed a little better than logit. The only discriminating variable is NIEQ (Net Income/Equity) which has a positive relationship with asset growth using either analysis technique. Discriminant analysis provides similar results in the full sample as well as the small and large firm sub-samples. Using logit the full sample and large firm sample more closely resemble each other.

Additional market variables could allow for better predictions. Another venue for research is an examination of liquidity ratios as well as issuance of debt or equity securities as they relate to asset growth. This study is subject to limitations drawn from the fact that only publicly traded Greek companies

are examined in the analysis. Future research might include an analysis of privately held companies and companies from other countries.

Table 6: Classification Table by Group (Percent Correct-Overall Index)

Panel A: Full Sample				
	Discriminant Analysis		**Logit**	
	Correctly Classified	**Incorrectly Classified**	**Correctly Classified**	**Incorrectly Classified**
Positive Growth	92(59)	65(41)	147(94.2)	9(5.8)
Negative Growth	25(23.8)	80(76.2)	100(95.3)	5(4.7)
Prediction Accuracy	65.9%		58.2%	
Outliers Excluded	Correctly Classified	Incorrectly Classified	Correctly Classified	Incorrectly Classified
Positive Growth	117(76.5)	36(23.5)	143(93.5)	10(6.5)
Negative Growth	53(52.0)	49(48.0)	88(86.3)	14(13.7)
Prediction Accuracy	65.1%		61.6%	
Panel B: Large Firm Sample				
	Discriminant Analysis		**Logit**	
	Correctly Classified	**Incorrectly Classified**	**Correctly Classified**	**Incorrectly Classified**
Positive Growth	3(60.0)	2(40.0)	1(20.0)	4(80.0)
Negative Growth	1(6.3)	15(93.8)	1(6.2)	15(93.8)
Prediction Accuracy	85.7%		76.2%	
Outliers Excluded	Correctly Classified	Incorrectly Classified	Correctly Classified	Incorrectly Classified
Positive Growth	2(50)	2(50)	0(0.0)	4(100.0)
Negative Growth	2(15.4)	11(84.6)	1(7.7)	12(92.3)
Prediction Accuracy	76.5%		70.6%	
Panel C: Small Firm Sample				
	Discriminant Analysis		Logit	
	Correctly Classified	Incorrectly Classified	Correctly Classified	Incorrectly Classified
Positive Growth	94(62.3)	57(37.7)	146(96.7)	5(3.3)
Negative Growth	23(26.1)	65(73.9)	86(97.7)	2(2.3)
Prediction Accuracy	66.5%		61.9%	
Outliers Excluded	Correctly Classified	Incorrectly Classified	Correctly Classified	Incorrectly Classified
Positive Growth	96(65.3)	51(34.7)	144(98.0)	3(2.0)
Negative Growth	39(44.8)	48(55.2)	82(94.3)	5(5.7)
Prediction Accuracy	61.5%		63.7%	

This table indicates prediction accuracy with an analysis of the dispersion of the firms in each group of companies. Panel A provides results for the full samples, Panel B provides results for large companies and Panel C provides results for small companies.

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