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LETTER FROM THE EDITOR

Welcome to the *Academy of Accounting and Financial Studies Journal*. The editorial content of this journal is under the control of the Allied Academies, Inc., a non profit association of scholars whose purpose is to encourage and support the advancement and exchange of knowledge, understanding and teaching throughout the world. The mission of the *AAFSJ* is to publish theoretical and empirical research which can advance the literatures of accountancy and finance.

Dr. Mahmut Yardimcioglu, Karamanoglu Mehmetbey University, is the Editor. The mission is to make the *AAFSJ* better known and more widely read.

As has been the case with the previous issues of the *AAFSJ*, the articles contained in this volume have been double blind refereed. The acceptance rate for manuscripts in this issue, 25%, conforms to our editorial policies.

The Editor works to foster a supportive, mentoring effort on the part of the referees which will result in encouraging and supporting writers. He will continue to welcome different viewpoints because in differences we find learning; in differences we develop understanding; in differences we gain knowledge and in differences we develop the discipline into a more comprehensive, less esoteric, and dynamic metier.

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ANALYZING FINANCIAL STATEMENTS AFTER CONVERGING INTERNATIONAL FINANCIAL REPORTING STANDARDS AND US FINANCIAL ACCOUNTING STANDARDS FOR PUBLICLY TRADED COMPANIES IN THE USA

Heikki Heino, Governors State University
Anthony Fontana, Governors State University

ABSTRACT

The most significant event in nearly a century affecting the professions of accounting and financial analysis is the planned adoption of International Financial Reporting Standards (IFRS) scheduled for full implementation on the SEC roadmap by 2014. The technical convergence between Generally Accepted Accounting Principles (GAAP) and IFRS will be cumbersome and the interpretations and analyses by financial analysts will require a great deal more research.

While this paper cannot fully address all differences or give justice to their corollary issues, it can possibly render some perspective on the effects upon financial statement analysis such as comparability, consistency, and transparency. The objective is: fair presentation of a company's financial position, its financial performance, and its cash flows.

INTRODUCTION

The desirability of accounting harmonization across countries and continents has been discussed and debated for many years. The potential benefits and costs of accounting harmonization have been debated with equal zest. The evidence is equally lacking of conclusion one way or other. Bae et.al (2008) suggest Generally Accepted Accounting Principles (GAAP) differences are associated with economic costs for financial analysts. Ball et.al (2003) suggest that there is little if any empirical evidence of the existence of magnitude of the benefits form or costs imposed by differences in accounting standards around the world. It seems to defy common understanding that there would not be benefits and costs savings of accounting harmonization across countries and continents for firms and financial analysts. Often heard arguments from the proponents of accounting harmonization include expectations that harmonization helps reduce information asymmetries, lowers the cost of capital, and increase capital flow across borders.

The EU parliament approval of regulation in 2005 requiring EU-registered companies to adopt International Financial Reporting Standards (IFRS) taking full effect in 2009 and the

Securities and Exchange Commission (SEC) announcement that it will accept financial statements prepared accordance with the IFRS from foreign filers in the U.S.A. without reconciliation to the GAAP commencing 2007. This paper is an attempt to describe some issues facing financial analysts following the convergence. The paper further is an attempt to quantify how the implementation of these changes affects certain financial ratios used by financial analysts internationally in analyzing non-financial firms. Assessment of the effects of harmonized financial statements of accounting standards on both investors and analysts is likely to offer valuable insight how investment decisions are made. Investment decisions by investors may well be of greater economic importance than analysts' forecasts and recommendations. However, investors have arguably more sources for information to formulate investment strategies, but analysts almost invariably utilize financial statements when formulating forecasts and recommendations. The next section describes the pertinent developments toward harmonization of accounting standards during the last decade.

BRIEF HISTORY

Six major international organizations have been key players in setting international accounting standards and in promoting harmonization of international accounting standards: IASB, EU, IOSCO (International Organization of Securities Commission, IFAC (International Federation of Accountants), United Nations Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting (ISAR). ISAR is part of the United Nations Conference on Trade and Development (UNCTAD), and OECD working Group (Organization for Economic Cooperation and Development Working Group on Accounting Standards. The international effort in harmonizing accounting standards formally began in 1973 with the establishment of the International Accounting Standards Committee (IASC). In April 2001 the International Accounting Standards Board (IASB) is established as the successor organization to the IASC. The IASB's mandate is to develop International Financial Reporting Standards (IFRS). In 2002 the IASB and the Financial Accounting Standards Board (FASB) issue the Norwalk Agreement, acknowledging their joint commitment to developing high quality, compatible accounting standards that could be used for both domestic and cross-border financial reporting. The Australian Accounting Standards Board announced in 2004 its intent to adopt the IFRS as the Australian accounting standard. In 2005 the chief accountant of the SEC releases a roadmap allowing in principle IFRS filings without GAAP reconciliation for foreign filers firms no later than 2009. Also, in 2005 the Chinese Ministry of Finance committed to converging the Chinese Accounting Standards to the IFRS within two years. The Canadian Accounting Standards Board proposed eliminating Canadian GAAP in favor of the IFRS by 2011. Also, the SEC issues a Concept Release asking if U.S. public companies should be given an option to follow IFRS instead of the U.S. GAAP.

In 2008 the SEC formally proposed an updated roadmap for moving U.S. public companies to IFRS. The AICPA's recognition in 2008 of the IASB as an accounting standards setter opened the door for U.S. private companies and not-for-profit organizations a choice to adopt the IFRS. The

Financial Accounting Standards Board (FASB) and the IASB update the Norwalk Agreement signed in 2002 with the goal of accelerating convergence of international and U.S. accounting standards. In 2011, Canadian and Indian companies are slated to begin using the IFRS. Also, Japan is slated to have eliminated major differences between the Japanese GAAP and the IFRS. Starting 2011 in the United States questions concerning the IFRS are expected to be included in the Uniform CPA exam. 2014 is the earliest year projected by accounting firms for mandating that large U.S. public companies convert their financials to IFRS. IASB chairman Sir David Tweedie has said that by December 2011, U.S. GAAP and IFRS "should be pretty much the same" (see, Chasan, 2008). It is also the year that the updated Norwalk Agreement expects all major capital markets to operate from one set of accounting standards. As of the beginning of 2009, there are 113 nations that either permit or require the use of IFRS (Holzblatt 2009). For a detailed description of origins, early history, and current structure of the IASB and the IFRS see, for example Epstein and Jermakowicz (2009). The following section describes various aspects affecting analysts' work with financial ratios.

SOME SIMILARITIES AND DIFFERENCES BETWEEN IFRS AND U.S. GAAP

Capital providers are the primary users of financial reporting. To accomplish the objective, financial reports should communicate information about an entity's economic resources, claims on those resources, and the transactions and other events and circumstances that change them (Epstein and Jermakowicz, 2009). One of the more material changes will be in the financial statement presentations. The balance sheet will no longer have assets and liabilities adjacent to each other or with assets over liabilities. Rather operating, financial, and investing assets and liabilities will be netted separately. The equity section will also change (see Exhibit 2). Income statements will be broken into operating, investing, and financing categories followed by income taxes and discontinued operations. COGS in the operating section will include change in inventory, materials, labor, and overhead depreciations (see Exhibit 3). Cash flows will be done by the direct method (see Exhibit 4 notes for additional information). The operating section will list cash from sales with deductions for inventory purchases, labor, materials, advertising, rent, compensation. The investing and financing sections will be similar to the current standard, but there will be a section for discontinued operations (see Exhibit 4). In June, 2008, the IASB boards issued tentative and preliminary views on how financial information will be presented. The goal is to create a common standard for the form, content, classification, aggregation and display of line items on the face of financial statements. The new guidelines are intended to help equity investors and other financial statement users better understand a business's past and present financial position and assess potential future cash flow. To be clear, these financial statements shift focus from net income to total comprehensive income, as all other comprehensive income items are now presented on the face of the statement. Missing from this discussion, however, are the concerns of smaller business entities, both public and nonpublic, that do not use international capital markets. It is unclear whether the reclassification of relevant line items (like current assets and current liabilities) to the footnotes will

create additional costs to entities that provide capital to small businesses. The first working principle is that financial statements should portray a cohesive financial picture of an entity. Ideally, financial statements should be cohesive at the line-item level, thus to the extent practical, an entity would label line items similarly across the financial statements and present categories and sections in the same order in each financial statement. Classifications are based on the different functional activities (see Exhibit 1).

IFRS remains a work in progress as the recent debates over fair value (mark to market) in political and regulatory circles demonstrate. Many attribute the financial cataclysms of the last year to fair value or mark to market accounting. The European Commission effectively suspended fair value rules in September adopting a "carve out" procedure which allowed broad reclassifications of financial assets permitting many assets to avoid fair value accounting. Very shortly thereafter, the IASB issued IAS 39 and IAS 7 allowing reclassification of certain non-derivative financial assets to be measured as if held at cost or amortized to maturity values. These moves actually put the IFRS closer to U.S. GAAP. Nobes (2001) surveyed partners in large accounting firms from more than 60 countries and benchmarked the local accounting standards in their country against the IFRS (previously IAS). Local GAAP differs from the IFRS on 80 accounting issues, issues incorporating recognition, measurement, and disclosure rules. This paper looks at limited issues such as, accounting for goodwill, earnings per share, segment reporting, disclosure, transparency, and mark-to-market. Goodwill: Comparing the IFRS (IAS 36) and the U.S.GAAP (SFAS 142 and SFAS 144) both rules require at minimum an annual testing of valuation. Under the IFRS any impairment loss in excess of goodwill is allocated on a pro-rate basis first to non-current assets and second to current assets. This allocation may not result in an asset being carried below its fair value (mark-to-market). The International Accounting Standards Board (IASB), which sets accounting rules for more than 100 countries, said on March 4, 2009 it is altering its mark-to-market accounting rules to bring them more closely in line with U.S. GAAP standards. The London-based board has amended mark-to-market rules, so that companies using International Financial Reporting Standards (IFRS) will also have to report asset values in a three-level hierarchy, based on the liquidity of the assets (see, Cole, 2008). Also Campbell et.al.(2008)state that mark-to-market, or fair value accounting, requires companies to measure their assets based on what they could fetch in a current market transaction. Under the three-level hierarchy, a Level 1 asset can be marked-to-market based on a simple price quote in an active market. The price of a Level 2 asset is "mark-to-model" and is estimated based on observable market prices and inputs. A Level 3 asset is so illiquid that its value is based entirely on management's best estimate derived from complex mathematical models. The fair market value of securities changes over time. The central issue in accounting for securities is: should they be continued to be presented at cost or adjusted for changes in their fair market value? IAS No.39 requires that companies categorize securities either as held-to-maturity, held-for-trading or available-for-sale. For non marketable securities and real assets the revaluation model is straightforward in initial revaluation of PPE. Increase in an asset's carrying value is credited directly to equity as "revaluation surplus". Decrease in an asset's carrying value is charged to the income

statement as an expense. Subsequent revaluation resulting in a decrease in value should be charged against any previous revaluation surplus and any excess should be expensed. To reverse a previous revaluation decrease, the subsequent upward revaluation should be recognized as income to the extent of the previous expense and any excess should be credited to equity. An expected present value (PV) technique such as, DCF is commonly used to value long-term assets and intangible assets. The uncertainty involved in estimating the future expected cash flows could contribute to the volatility of these mark-to-market estimates."The financial crisis has shown that a clear understanding of how entities determine the fair value of financial instruments, particularly when only limited information is available, is crucial to maintaining confidence in the financial markets," IASB Chairman Sir David Tweedie said in a statement. Some bankers and investors have blamed fair value accounting rules for exacerbating the financial crisis, saying banks were forced to mark down assets to artificially low prices. Differences between standards used in the United States and overseas have also been a source of contention, amid claims that there was an un-level playing field. The IASB's accounting changes are also intended to "clarify and enhance the existing requirements for disclosure of liquidity risk," the IASB said. The board said that additional disclosures would also be required for Level 3 assets. The amendment to International Financial Reporting Standards (IFRS) affects a standard known as IFRS 7, and takes effect for annual periods beginning on or after January 1, 2009, the IASB said. (Chasan 2008).

These conditions have prompted political reactions to amend or abolish this principle while others such as British PM Gordon Brown and Berkshire/Hathaway Chairman Warren Buffet strongly endorse it. Buffet has said that fair value allows investors to truly know "…who's naked when the water goes out…" (AccountancyAge 2008). See Krumwiede (2008) for the following example: Consider firm X with $500 in operating assets and $400 in long-term debt originally borrowed to finance the operating assets. At year end, the fair value (level 1 asset) of the assets is $200. Same conditions that decreased the value of the assets decrease the creditworthiness of the company and thus the market (fair) value of its long-term debt is $300. In summary, the assets have decreased have decreased in value by $300, and liabilities have decreased by $100. The decrease to equity from the mark-to-market measurement is the net of the two, or $200. Now, consider an identical firm Y in assets and operations ($500 in assets at the beginning of the year and a $200 value for the assets at the end of the year). Firm Y isn't leveraged and has no related long-term debt. For firm Y the decrease to equity is $300. Firm Y has the poorest performance as measured by the reduction in equity. It seems that this application of mark-to-market accounting could compromise the relevance of financial reporting for a short period after its full implementation.

POSSIBLE EFFECT ON SELECTED FINANCIAL RATIOS

Analysts work in a variety of positions. Some are equity analysts whose main objective is to evaluate potential equity investments others are credit analysts who evaluate the creditworthiness of a company. Analysts are involved in variety of other tasks, such as, evaluating the performance

of a subsidiary, evaluating private equity investments, or finding stocks that are overvalued for purpose of taking a short position. Many investment texts identify number of financial ratios that financial analysts commonly use when performing relative or fundamental valuations. Return on Equity (ROE) and Return on Assets (ROA) are maybe the two most widely discussed profitability ratios. Often the discussion includes a reference to Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA). Market related ratios discussed include the Price Earnings (P/E) ratio and the Earnings Price (E/P) ratio or the earnings yield ratio. The book to market (B/M) ratio is worth mentioning because the expected effect on book value from the adoption of the mark-to-market rules. For example, one of the world's most important infrastructure companies Macquarie Group – whose listed funds own toll roads in Indiana, Chicago and Britain and airports in Copenhagen, Brussels and Sydney disclosed that it is not continually marking assets to the market rate. Directors of the funds determine the value once every six months, partly based on market prices and partly on the cash they generate (Santini 2009). The analyst must reverse the revaluation adjustments that a firm has made in preparing its financial statements if the analysis is to be comparable with a firm that complies with U.S. GAAP. Usually this would involve reducing both fixed assets and other equity by the amount of the upward revaluation and increase both fixed assets and other equity by the amount of the downward revaluation.

The Price Earnings Growth the PEG ration and The Present Value of Growth Opportunities (PVGO) are mentioned too. Before discussing these and the Free Cash Flow valuation it of course is understood that a firm's economic performance is not affected by how the revenue, expenses, assets and liabilities are recorded. It however, is important to look at some of the steps an analyst is expected to take when calculating these metrics. Especially, important seems to be the comparison between what has been the practice using the current financial statements as the beginning point for valuation and what is expected when using IFRS reporting standards. This paper uses Exhibits 1 through 5 prepared by McClain and McLelland (2008). The ROE is usually defined as Net Income/Equity. Net Income is the after tax income. When looking at the Net Income (Exhibit 3) the question is, is this number comparable to the number when using the current accounting standards? No and yes; yes except that if a firm has research and development expenses the money spent on development (how it is defined is a different matter) is capitalized rather than expensed and inventory valuation. U.S. GAAP allows the LIFO method for inventory costing, whereas IFRS does not. On the other hand when comparing the Equity (Exhibit 2, Statement of Financial Position) we have to consider the effect of using the mark-to-market valuation versus the historical cost perspective. As stated earlier, changes in asset valuation are netted out through the revaluation account and closed to the retained earnings account. Clearly the mark-to-market valuation can have a significant effect on the equity (common stock, paid in capital, plus retained earnings, less treasury stock, and convertible preferred stock. Callable preferred stock is reported in liability). The ROA is defined as Net Income/Total Assets. The definition of net Income was discussed above. Total Assets (Exhibit 2) is found by adding short term assets, net long-term assets, net business assets, total financing assets, and assets classified as held for sale. The amount of assets can be different

if a firm has cash expenses classified as development costs. The value of investing assets is increased accordingly net of amortization.

The EBITDA excludes non-operational expenses from the earnings figure. This so called operational (operating) profit is used by analysts typically to compare a firm's stock price/EBITDA multiple to an industry or sector average. The idea is that a stock that sells for say for a multiple of 11 may be attractively priced relative to other firms in an industry where the average is 15.

The present value of growth opportunities (PVGO) is calculated from the firm's current stock price {PV=E/k+PVGO}, where E=trailing earnings per share for twelve months, PV=current stock price, k=shareholder's required rate of return. We can calculate the PVGO. Let's assume that the PV is $29.70, E is $1.75, and k is %12.89, then PVGO is $ 16.12. In words, the PVGO represents about %54 of the current stock price with current earnings representing about %46. Many analysts argue that one should choose the stock with the lower (when comparing two stocks) PVGO. This way one is not likely to overpay for the uncertain future growth. On the other hand an analyst interested in growth stocks will likely seek out firms with promising future and high PVGO. Information about common shares outstanding and how many shares have been authorized is disclosed in footnotes rather than in the body of the financial statements. The numbers necessary to calculate the ratios are not materially altered from the current practice.

The PEG ratio is appealing to many analysts. The PEG ratio=firm's P/E ratio divided by its expected future earnings growth rate. One can use trailing or forward looking earnings and growth rate. Many fund analysts like to add the dividend yield to the growth rate because the dividend yield (or rather the cash from dividend) is appealing to many investors. One usually looks for a PEG value less than 1.0. Finally, when comparing an IFRS company, which has written up the value of its intangible or tangible long-term assets, with a U.S. company, an analyst will eliminate the effect of the write-ups in calculating asset-based ratios (Robinson, et.al. 2009).

There are essentially three ways in which a firm can get cash: borrow it (cash from financing), sell an asset (cash flow from investing), or earn it (cash from operations). The cash from operations is the most important of the cash flows. Without it a firm will run out of cash sooner or later. As with EBITDA, analysts consider the stock price as a multiple of cash flow. A higher multiple means that the current stock price is expensive relative to the operating cash flow earned. Note, this does not necessarily mean that the stock is overpriced. A variant of this concept is the free- cash-flow. This is the amount of cash funds available to the management (common shareholders) after allowing for necessary capital expenditures in the future (usually five years). Calculating the free-cash-flow requires judgment and subjectivity. Exhibit 6, tabulates differences between IFRS and U.S. GAAP in cash flow statements (Robinson, et.al.2009). See, Exhibit 4 and notes to it too.

CONCLUSION

The *Wall street Journal* (Eavis 2009) reported that the increased pressure from many large banks and members of Congress, The Financial Accounting Standards Board, voted April 2, 2009 to ease certain asset-valuation rules. One of the changes allows companies slightly more leeway in valuing assets that don't trade in active markets. Vigilance is required when financial companies can place more emphasis on valuations arrived at with internal models.

The economic and financial health of financial and non financial firms is of course unchanged after the full convergence of IFRS with the US GAAP but the effects of the convergence will last for a long time and create challenges and opportunities for all stakeholders. In the May 7 conference called "Financial Reporting in a Changing World" in Brussels John Smith, IASB member told the audience that "it is in the interest of the United States to adopt IFRS in the next five years". The uncertainty of the political will of the current administration in the US is complicating matters greatly but it is clear that the cost to the US of failing to adopt IFRS will be high taking into consideration that Brazil, Canada, china, India, Japan and Korea are committed to adopting IFRS, and the European Union is already using IFRS.

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Exhibit 1 Working Format for Presenting Information in the Financial Statements

Statement of Financial Position	Statement of Comprehensive Income	Statement of Cash Flows
Business • Operating assets and liabilities • Investing assets and liabilities	**Business** • Operating income and expense • Investing income and expense	**Business** • Operating cash flows • Investing cash flows
Financing • Financing assets • Financing liabilities	**Financing** • Financing asset income • Financing liability expense	**Financing** • Financing asset cash flows • Financing liability cash flows
Income Taxes	**Income Taxes (related to business and financing)**	**Income Taxes**
Discontinued operations	**Discontinued Operations, Net of Tax**	**Discontinued Operations**
Equity	**Other Comprehensive Income, Net of Tax**	**Equity**

Exhibit 1 Notes

Comparative financial notes are required, one year at a minimum. The business section includes both operating and investing categories. Operating assets and liabilities are those that management views as related to the central purpose for which the firm is in business and changes in those assets and liabilities which are relevant. The investing category would include all assets and liabilities that management views as unrelated to the central purpose for which the firm is in business and any changes in those assets and liabilities. A firm would use its investing assets and liabilities to generate a return but would not use them in its primary revenue and expense generating activities. The financing section would include only financial assets and financial liabilities that management views as part of the financing of the firm's business activities. Those are referred to as financing assets and liabilities. True and fair override of IFRS permitted in "extremely rare" circumstances to achieve a fair presentation. No hierarchy established beyond IFRS, but implied by language of IAS 8.

Exhibit 2 Notes

The first major difference in the statement of financial position (balance sheet) is that assets and liabilities are not separated into distinct sections-no assets on the left side of the page with liabilities and equity on the right side or assets on the top half of the page with liabilities and equity below. Specific guidance on offsetting of assets and liabilities is required. Current/noncurrent classification is the norm (liquidity presentation permitted under limited circumstances). Assets are positive numbers, while liabilities and equity are negative. Totals are presented for each category and section, but subtotals for short-term assets/liabilities or grand totals for assets/liabilities will be disclosed either at the bottom of the statement or in the footnotes. The balance sheet, of course, still balances. In the hypothetical example used in Exhibit 2, total assets in 2007 for the hypothetical Hutch Manufacturing Co. are $347,500, total liabilities are $184,000, and the resulting equity is $163,500. Totals for short-term assets, short-term liabilities, long-term assets and long-term liabilities may be disclosed either at the bottom of the statement or in the footnotes. Each separate line item should use only one measurement basis.

Exhibit 2 Hutch Manufacturing Co. Consolidated Balance Sheets

	2007	2006
BUSINESS		
Operating assets and liabilities		
Short term		
Receivables	$68,000	$54,000
Less: Allowance for bad debts	(2,000)	(1,000)
Inventories	26,000	20,000
Prepaid expenses	19,000	24,000
Short-term assets	111,000	97,000
Accounts payable	(19,000)	(16,000)
Accrued liabilities and other	(56,000)	(74,000)
Short-term liabilities	(75,000)	(90,000)
Long term		
Property, plant, and equipment	34,000	24,000
Less: Accumulated depreciation	(9,000)	(6,000)
Goodwill	20,000	25,000
Intangibles	82,000	82,000
Less: Accumulated amortization	(21,000)	(14,000)
Other assets and liabilities, net	(5,000)	(3,000)
Net long-term assets	101,000	108,000
Net operating assets	$137,000	$115,000
Investing assets and liabilities		
Long term		
Available-for-sale securities	2,000	3,000
Investment in affiliate – equity method	6,000	5,000
Total investing assets	$8,000	$8,000
Net business assets	$145,000	$123,000
FINANCING		
Financing assets		
Short term		
Cash	92,000	94,000
Total financing assets	92,000	94,000
Financing liabilities		
Short term		
Dividends payable	(3,000)	(3,000)
Short-term debt and current portion of long-term	(14,000)	(1,000)
Short-term financing liabilities	(17,000)	(4,000)
Long term		
Long-term debt	(71,000)	(49,000)
Long-term financing liabilities	(71,000)	(49,000)
Net financing assets	$4,000	$41,000
INCOME TAXES		
Short term		
Income tax payable	(8,000)	(12,000)
Long term		
Deferred tax assets, net	10,500	13,500
Net income tax assets	$2,500	$1,500
DISCONTINUED OPERATIONS		
Assets classified as held for sale	20,000	22,000
Liabilities classified as held for sale	(8,000)	(8,000)
Net assets held for sale	$12,000	$14,000
EQUITY		
Common stock and additional paid in capital	(47,000)	(40,000)
Treasury stock	142,000	97,000
Retained earnings	(250,750)	(228,000)
Accumulated other comprehensive income	(7,750)	(8,500)
Total equity	$(163,500)	$(179,500)

Exhibit 3 Hutch Manufacturing Co. Consolidated Statements of Comprehensive Income

	2007	2006
BUSINESS		
Operating		
Sales	$384,000	$315,000
Cost of goods sold		
Change in inventory	6,000	2,000
Materials	(135,000)	(108,000)
Labor	(28,000)	(23,000)
Overhead–Depreciation	(1,000)	(1,000)
Total	(158,000)	(130,000)
Gross profit on sales	226,000	185,000
Selling expenses		
Compensation expense	(5,000)	(5,000)
Advertising expense	(43,000)	(37,000)
Bad debt expense	(1,000)	-0-
Other selling expenses	(27,000)	(15,000)
Total	(76,000)	(57,000)
General and administrative expenses		
Compensation expense	(15,000)	(12,000)
Rent expense	(5,000)	(5,000)
Amortization expense	(7,000)	(8,000)
Other G&A expenses	(46,000)	(38,000)
Depreciation	(2,000)	(1,000)
Total	(75,000)	(64,000)
Other operating expenses		
Research and development	(16,000)	(17,000)
Other operating expenses	(7,000)	(13,000)
Total	(23,000)	(30,000)
Operating income	$52,000	$34,000
Investing		
Equity in earnings of affiliate	2,000	2,000
Dividend income on available-for-sale securities	1,000	1,00
Investing income	$3,000	$3,000
Business income	$55,000	$37,000
FINANCING		
Interest expense	(5,000)	(3,000)
Financing expense	$(5,000)	$(3,000)
INCOME TAXES		
Current tax expense	(9,000)	(7,000)
Deferred tax expense	(4,000)	(2,000)
Income tax (expense)	$(13,000)	$(9,000)
DISCONTINUED OPERATIONS		
Loss on discontinued operations, net of $750 of income tax benefit	$(2,250)	$-0-
Net Income	$34,750	$25,000
OTHER COMPREHENSIVE INCOME		
Unrealized loss on available-for-sale securities (Investing), net of $250 and $500 of income tax benefit, respectively	$(750)	$(1,500)
Total Comprehensive Income	$34,000	$23,500

Exhibit 3 Notes

This is more a true measure of economic income which is the firm's change in net worth. Within the sections and categories a firm will present its revenues, expenses, gains and losses based on its primary activities or functions (selling, general, administrative, etc.) or by nature (salaries, changes in inventory, work in progress, etc.) may be shown if it improves the usefulness of the statement. FASB and the IASB decided that the financial statement presentation project should not alter existing standards relating to what items are recognized outside of profit or loss. Because of that stance, existing guidance remains unchanged on presentation of other comprehensive income items in a statement of comprehensive income and cannot be relegated to statement of changes in equity. Extraordinary item classification no longer permitted, but unusual items can be segregated. A firm should present a stand-alone statement of comprehensive income with OCI items presented in a separate section. Within that section a firm should indicate, parenthetically or otherwise, which category-operating, investing or financing each OCI item relates to. The income taxes section in the statement of financial position would include current and deferred income tax assets and liabilities recognized pursuant to FASB Statement no. 109, Accounting for Income Taxes, and IAS 12, Income Taxes. Cash flows related to those assets and liabilities would be presented in the income tax section of the statement of cash flows. In the statement of comprehensive income, income taxes would continue to be allocated among continuing operations, discontinued operations, items of other comprehensive income, and items charged or credited directly to equity using existing guidance on intra-period tax allocation. Consistent with the statement of financial position, a total would be presented for each category and section, and this statement would include a total for comprehensive income.

Exhibit 4 Notes

Choice allowed in classifying dividends and interest paid as operating of financing cash flows; or interest and dividends received as operating, investing, or financing cash flows. Overdrafts can be included in cash under defined conditions. The format is similar to FASB no 95, Statement of Cash Flows, and IAS 7, Cash Flow Statements, with two major changes. First, the notion of cash equivalents is scrapped. It is cash only. In addition, cash flow will be presented in the direct method. Under Statement no. 95, cash flow is reported under either the indirect method (starting with net income) or the direct method (starting with top-line revenue). The new model will start at the top of the statement of comprehensive income and work through each new section. This does not mean that the indirect method will be eliminated. As currently required by Statement no. 95, cash flows from operations must be reconciled to operating income as a supplement to the direct method. The boards are expected to seek input to determine if this requirement is still needed, given the new reconciliation statement.

Exhibit 4 Hutch Manufacturing Co. Consolidated Statements of Cash Flow

	2007	2006
CASH FLOWS FROM BUSINESS		
Operating		
Cash received from sales	$370,000	$318,000
Cash paid for goods sold		
Inventory purchases	(132,000)	(101,000)
Labor	(28,000)	(23,000)
Total	(160,000)	(124,000)
Cash paid for selling activities		
Compensation	(5,000)	(5,000)
Advertising	(38,000)	(48,000)
Other selling	(25,000)	(15,000)
Total	(68,000)	(68,000)
Cash paid for general and administrative activities		
Compensation	(15,000)	(13,000)
Rent	(5,000)	(5,000)
Other general and administrative	(59,000)	(39,000)
Total	(79,000)	(57,000)
Cash paid for other operating activities		
Research and development	(16,000)	(17,000)
Capital expenditures	(10,000)	-0-
Other	(7,000)	(13,000)
Total	(33,000)	(30,000)
Net cash provided by operating activities	$30,000	$39,000
Investing		
Dividends received	1,000	1,000
Dividends received	1,000	1,000
Net cash provided from investing activities	$2,000	$2,000
Net cash provided by business activities	$32,000	$41,000
Financing		
Dividends paid	(12,000)	(12,000)
Interest paid	(5,000)	(3,000)
Proceeds from debt	35,000	5,000
Purchases of treasury stock	(45,000)	(2,000)
Proceeds from common stock	7,000	-0-
Net cash used in financing activities	$(20,000)	$(12,000)
Income Taxes		
Income taxes paid	(13,000)	(4,000)
Net cash used in income tax activities	$(13,000)	$(4,000)
Discontinued operations		
Cash flows used in discontinued operations	$(1,000)	$4,000
Change in cash	$(2,000)	$29,000
Beginning cash	$94,000	$65,000
Ending cash	$92,000	$94,000

Exhibit 5 Notes

The first reconciling column (B) is accruals, allocations and other charges not from re-measurements. Examples of items in column B include timing differences such as changes in accounts receivable/ accounts payable and systematic allocations such as depreciation, purchases of property, plant and equipment, along with other changes in business operating assets and liabilities. A second reconciling column (C) contains recurring fair value changes (termed valuation adjustment by the IASB) such as changes in the fair value of available-for-sale securities. The final reconciling column (D) is for re-measurements other than recurring fair value changes. This would include asset impairments for items such as goodwill and discontinued operations.

EXHIBIT 6

TOPIC	IFRS	U.S.GAAP
Classification of Cash Flows:		
Interest received	Operating or investing	Operating
Interest paid	Operating of financing	Operating
Dividends received	Operating or investing	Operating
Dividends paid	Operating or financing	Financing
Bank overdrafts	Considered part of cash equivalents	Not considered part of cash and cash equivalents and classified as financing
Taxes paid	Generally, operating, but a portion can be specifically identified with these categories	Operating
Format of statement	Direct or indirect; direct is encouraged	Direct or indirect; direct is encouraged. If direct is used, a reconciliation of net income and operating cash flow must be provided.
Disclosures	Tax cash flows must be separately disclosed	Interest and taxes paid must be disclosed in footnotes if not presented on the statement of cash flow statement

CORPORATE SOCIAL AND FINANCIAL PERFORMANCE: A CANONICAL CORRELATION ANALYSIS

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ABSTRACT

A major stream of research has resulted from efforts to understand the relationship between social performance and financial performance that exists for corporations. Can a company do well by doing good? Using canonical correlation, the results of this study indicate a strong relationship between a company's social performance and its financial performance. Further, this association differs across industries. In examining social performance, both strengths and concerns are important and should be considered separately. Finally, this study points to the importance of operating income as a key financial performance measure.

INTRODUCTION

The relation between a firm's financial performance and its corporate social performance (CSP) has been investigated for more than half of a century (Preston & O'Bannon, 1997), yet the nature of the relationship remains unresolved. One view suggests that greater CSP will manifest in superior financial performance, in part because managers who are more socially responsible are perceived as being more likely to generate profits (Alexander & Bucholz, 1978). A contrary view suggests a negative relation between financial performance and CSP. Although reasons are somewhat varied, at the root is Friedman's (1970) argument that "managerial attention to interests other than those of investors is a breach of trust" (Preston & O'Bannon, 1997, p. 420).

Not surprisingly, empirical evidence also spans the continuum. Some research shows a negative relation between CSP and financial performance (Shane & Spicer, 1983 and Vance, 1975); others show a positive relation (Riahi-Belkaoui, 1992; Waddock & Graves, 1997; Margolis & Walsh, 2003); some suggest no relation (Aupperele et al, 1985; Ingram & Frazier, 1983); and yet others find mixed evidence (Cochran & Wood, 1984 and Coffey & Fryxell, 1991). Griffin & Mahon (1997) and Callan & Thomas (2009) provide a more comprehensive discussion of previous findings. This broad spectrum of findings suggests that the relation between CSP and financial performance may not be consistent across firm-specific contexts and/or for all types of corporate social actions.

Consequently, several causes of these varied findings have been identified. For instance, Waddock and Graves (1997) show that the extent of CSP varies across industries while Russo and

Fouts (1997) provide evidence that the relation between CSP and financial performance is related to industry growth. Measurement of CSP has also been at issue because researchers frequently combined multiple aspects of a firm's attributes to arrive at a single measure of social performance. Further complications arise concerning the direction of causation (O'Bannon & Preston, 1993). On one hand, positive financial performance may be the precursor of higher CSP via the availability of slack resources (McGuire et al, 1990). On the other hand, higher CSP may foster better relations with stakeholder groups which, in turn, could lead to higher profitability.

The current research addresses these issues by examining the relation between financial performance and CSP separately for each industry and for positive and negative firm social performance attributes as reported by the Kinder Lydenburg Domini (KLD) ratings data. Further, the analysis is performed using canonical correlation which allows the interpretation of the results without imposing an assumption of causality. Findings suggest that financial performance is related to both CSP strengths and weaknesses (Mattingly & Berman, 2006) but this relation differs across industries. Enhancing our understanding of this relation is important to investors as they strive to assess the performance implications of their investment strategies. Managers also should strive to understand how their actions are related to overall firm value, from the perspective of increasing and maintaining stakeholder wealth.

The remainder of the paper is organized as follows. The next section contains a literature review, identifying the important relationships and variables examined in prior research. The following section describes the variables, the methodology and the results of this investigation. The paper ends with the conclusions and limitations.

LITERATURE REVIEW

Predictions on the relation between CSP and financial performance range from expecting a positive association to the other end of the spectrum of expecting a negative association. One school of thought predicts a positive relation because managers who are effective at social performance may simply have superior management skills and are thus more likely to generate profits (Alexander & Buchholz, 1978). More socially responsible actions may also improve the firm's reputation and its relations with stakeholders such as bankers, investors and government officials, resulting in potential economic benefits (Moussavi & Evans, 1986). Spicer (1978) provides anecdotal evidence of stronger constituency relations by documenting that institutional investors consider social aspects in their investment decisions.

A positive association between CSP and financial performance can be directly linked to stakeholder theory. Clarkson (1995, p. 106) describes stakeholders as "... persons or groups that have, or claim, ownership rights or interests in a corporation and its activities..." He further partitions stakeholders as primary or secondary. Primary stakeholders are those without whom the organization is no longer a going concern. Examples of primary stakeholder groups are investors, employees, customers, suppliers and the community.

Clarkson (1995) asserts that a corporation exists to create and distribute wealth to all of its primary stakeholders. Failure to do so can be detrimental to the firm's survival and lead to stakeholder groups withdrawing from the organization altogether. It is recognized that satisfying stakeholder groups can provide benefits that go beyond merely continued participation (McWilliams & Siegel, 2001). Hillman and Keim (2001) conjecture that building relations with primary stakeholders has the potential to create valuable intangible assets such as reduced employee turnover, increased customer and supplier loyalty, as well as improved reputation. This, in turn, can lead to a competitive advantage and ultimately increase shareholder wealth. This insight is not new; General Robert Wood Johnson expressed a similar view as he led Sears' post WWII growth. According to Clarkson (1995), General Johnson asserted that profit is the "by-product" of a firm's success in satisfying the needs of its primary stakeholder groups.

Building stakeholder relationships can be costly and some question whether these costs will place the firm at a competitive disadvantage and inhibit financial performance (Vance 1975; Aupperle et al, 1985; Preston & O'Bannon, 1997). These costs involve both actual expenditures and foregone opportunities. Outlays can include charitable contributions, environmental protection procedures and promoting community development plans. Opportunity costs may involve foregoing product lines such as weapons and/or geographic locations that are controversial (McGuire et al, 1988). More recently, Stephenson (2009) examines the relation between CSP and a firm's competitive advantage and notes that achieving such an advantage can be difficult. He suggests that CSP must be integrated with all aspects of the organization's operations for benefits to accrue. McWilliams and Siegel (2001) conclude that in equilibrium, firms that engage in CSP will exhibit the same level of profitability as firms that do not. Further, McWilliams et al. (2006, p. 5) recognize that "Consumers often find it difficult to determine if a firm's internal operations meet their moral and political standards for social responsibility..." This may be in part because when companies publish annual reports and include socially responsible actions, consumers perceive this information as biased (McWilliams et al, 2006). Thus it is unclear whether a firm will reap the financial benefits of CSP.

Friedman (1970) attributes social performance activities to managers' self interest where the mere existence of CSP signals agency problems. Underlying this is the assumption that expenditures on CSP are a misuse of resources and alternatively that those resources should be invested in internal projects or distributed to shareholders. An example cited by Preston and O'Bannon (1997, p. 423) is that of managerial opportunism. Managers are assumed self-interested and when compensation packages are related to profit and stock price, managers have incentives to reduce social expenditures in order to maximize their compensation when profits are high. When profits are low, managers have incentives to increase visible social expenditures as a means to justify poor performance. This behavior implies a negative relation between CSP and financial performance.

Existing empirical research provides mixed results on the relation between CSP and financial performance, mirroring the prior discussion of theories/conjectures. For instance, Vance (1975) found that corporations with strong 'social credentials' had lower stock price performance relative

to the market average. Griffin and Mahon (1997, p. 6) document several additional studies showing a negative relation but note that many of them examine the stock market reaction relative to 'potential corporate illegalities.' There is also empirical research which shows no significant relation (Aupperle et al, 1985; Ingram & Frazier, 1983). The majority of studies, however, support a positive association (Preston & O'Bannon, 1997; Waddock & Graves, 1997) where a company's social performance is positively associated with its financial performance (Pava & Krausz, 1996; Margolis & Walsh, 2003). These mixed findings have provided an incentive for researchers to examine whether the social and financial performance relation varies with underlying contextual circumstances.

These contexts relate to several factors including CSP measures as well as the firm's characteristics and its environment. Although CSP measures have been an issue, the Kinder Lydenburg Domini (KLD) Social Ratings data are used extensively in academic research (Mattingly & Berman, 2006). The KLD ratings consider several classes of social responsibility and categorize the firm's related actions as strengths or weaknesses within that class. The KLD ratings consider a corporation's social actions along the dimensions of local communities, diversity, employees, natural environment, product quality and safety, and corporate governance. Prior research has often measured social responsibility as a firm's net strengths or net weaknesses. Mattingly and Berman (2006) argue that combining strengths and weaknesses can mask the underlying relations. Accordingly, they conduct a factor analysis showing that strengths and weaknesses load on separate factors, which suggests that they measure different constructs. As a result of these findings, Mattingly and Berman (2006, p. 20) conclude that "... positive and negative social action are both empirically and conceptually distinct constructs and should not be combined in future research ..." As a result, this study investigates strengths and weaknesses as separate measures of CSP.

Many empirical studies have identified the firm characteristics of size and risk as important factors in the social/financial performance relationship (Ullman, 1985; Russo & Fouts, 1997; Margolis & Walsh, 2003; and Callan & Thomas, 2009). In a meta-analytical study, Orlitzky and Benjamin (2001) found that companies with higher social performance experience lower financial risk. Both firm size and financial risk are included in the analyses reported here. Another aspect of importance is the firm's environment.

Griffin and Mahon (1997) address industry differences. They draw upon prior work which recognizes that each industry is subject to a unique set of circumstances, including governmental regulations, consumer orientation, and public visibility. These circumstances can create a "specialization" of social interests (Holmes, 1977; Ingram, 1978). Accordingly, the relationship between CSP and financial performance is examined individually for ten economic sectors.

The current study uses canonical correlation to investigate the relationship between corporate social and financial performance. This methodology allows several measures of financial performance to be related to several measures of social performance. The methodology is discussed next.

METHODOLOGY

The variables, method for analyses and results will be addressed in turn.

Corporate Social Performance

Corporate social performance is the complex set of behaviors exhibited by firms as they interact with their stakeholders and their environment. This study uses the KLD data set for the year 2007. KLD reports annually, the number of strengths and the number of concerns across seven qualitative issues. These measures are reported for over 3,000 companies. The issues identified and tracked by KLD are the following: community, corporate governance, diversity, employee relations, environment, human rights and product. The subcategories for strengths and concerns within each of the seven areas are provided in Appendix A.

Table 1: Descriptive Statistics for Total Concerns and Total Strengths

*Economic Sector	Average Concerns	Average Strengths	Number of Firm Observations
Consumer - Discretionary			2.411.46358
Consumer - Staples	3.08	2.5	50
Energy	3.01	0.89	74
Financials	1.39	1.32	258
Health Care	1.96	1.41	118
Industrials	2.3	1.44	166
Information Technology	1.71	1.81	130
Materials	3.44	1.76	59
Telecommunications	1.83	1.25	18
Utilities	3.51	2.22	42

*Economic Sectors represent the ten economic sectors defined in Compustat.

For this study, one measure of corporate social performance is calculated by adding the number of concerns a company receives for each of the seven areas just identified. Thus, a larger number of concerns would be associated with a company which has exhibited poor social performance behavior. Similarly, the second measure of CSP is the summation of the number of strengths a firm has for each of the seven issues. A firm with a large number of strengths is one which has demonstrated highly socially responsible behavior. Table 1 shows the distribution of the 1,273 sample observations across economic sectors as well as the average number of total strengths and concerns for each sector. The utilities sector has the highest average number of concerns at 3.51

while financials have the lowest, 1.39. Strengths range from a high of 2.50 for consumer staples to a low of 0.89 for the energy sector.

Corporate Financial Performance

Corporate financial performance (CFP) has been measured in a variety of ways. Some studies use accounting information reported in the financial statements. The following accounting measures are used in this investigation: earnings per share, operating income and return on assets. The data for these financial performance measures were obtained from the 2007 data on Compustat. These are sometimes identified as short-term performance measures. Other studies have used market measures, such as returns, to capture the expected long-term performance of the firm. This study uses the following market measures to capture a company's financial performance: annual return, price-to-earnings (P/E) ratio, and the market value to book value (MV/BV) ratio. The first is a market related measure while the P/E ratio and MV/BV ratio are market measures scaled by book measures. One advantage of using such measures is that they capture the consensus of the financial market participants' perceptions of the current and future economic performance of a company. The 2007 returns data were collected from the Center for Research in Securities Prices (CRSP) while prices, book value and earnings were obtained from Compustat.

Prior research has shown that risk can affect the social performance / financial performance relationship (McWilliams & Siegel, 2000; Waddock & Graves, 1997).
As a result, the ratio of total debt to total assets (TD/TA) is included as a proxy for financial risk while beta is included as a proxy for market risk. Total debt, total assets and beta were obtained from Compustat.

The mean, minimum and maximum values for the financial performance, control and risk variables are reported in Table 2. It is helpful to remember that the study uses 2007 data, and although the recent economic downturn probably had its start in 2007, this time frame most likely represents more 'normal' circumstances.

Method

The use of canonical correlation analysis is especially appropriate for this study. Canonical correlation examines the simultaneous relationship between two sets of variables. This paper uses a set of corporate social performance (CSP) variables and a set of corporate financial performance (CFP) variables. This simultaneous relationship does not require any causality assumptions (Haslem et.al, 1992) and the relationship can be bidirectional. The methodology determines a linear combination of the CSP variables and a linear combination of the CFP variables and control variables such that the resulting correlation between the two sets is maximized. This relationship is depicted in Illustration 1.

Table 2: Descriptive Statistics for the Financial Performance Variables				
Variable	N	Mean	Minimum	Maximum
Earnings per share	2171	1.403	-76.52	144.15
Operating income	2219	599.32	-13,558	48282
Total assets	2219	14989.33	9.1	2187631
Total debt/Total assets	2206	27.53	0	162.04
Return on assets	2199	4.5	-253.66	113.02
Beta	2211	1.15	-124.11	4.21
Annual return	2212	-0.01087	-0.97	7.95
Price/earnings	2219	28.22	-1019	17324
Market value/book value	2219	4.99	-288.27	1576

Earnings Per Share = Earnings per share of common stock outstanding (EPS) as defined in Compustat.
Operating Income = Operating income after depreciation in millions of dollars as defined in Compustat.
Total Assets = Total Assets in millions of dollars as defined in Compustat.
Return on Assets = Income before extraordinary items- available for common, divided by Total Assets and then multiplied by 100 as defined in Compustat.
Beta = A company's market model beta calculated over a 60-month period, as defined in Compustat.
Annual Return = A company's 12-month return cumulated over the 12-month period ending December 31, 2007.
Price / Earnings = Closing price per share divided by earnings per share as defined in Compustat.
Market Value / Book Value = Closing price per share divided by book value of common equity per share as described in Compustat.
Economic Sectors are as defined in Table 1.

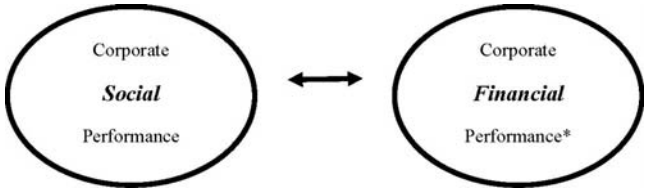

Illustration 1

$$\alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \ldots + \alpha_n X_n \longleftrightarrow \beta_1 Y_1 + \beta_2 Y_2 + \beta_3 Y_3 + \ldots + \beta_m Y_m$$

*and appropriate control variables

In canonical correlation, the null hypothesis is the following:

H_o: The current canonical correlation and all that follow are zero.

In other words, the null hypothesis is that there is no significant relationship between the company's social performance and its financial performance.

One advantage of canonical correlation analysis is that the method is appropriate in the presence of multicollinearity. It does, however, require careful interpretation. As shown in Illustration One, canonical correlation will determine the coefficients (the α's and the β's)

of the linear combinations of the variables so that the correlation between the two sets is maximized. These linear combinations are called canonical variates and there are two of them: one for the CSP variables and one for the CFP variables. However, as in a multiple regression, the coefficients in the canonical variates are affected by multicollinearity. In this study, it is likely that the financial performance variables are correlated with each other. For example, it is reasonable to expect that operating income and earnings per share are correlated. Once one of them has been entered into the linear combination for the financial performance variables, the other one will enter with a much smaller coefficient. This is because the contribution of the second financial performance variable has been subsumed, to some degree, by the first variable. Therefore, it is more informative to look at the correlation of each variable in the set with its own canonical variate.

Table 3: Squared Canonical Correlation by Economic Sector

*Economic Sector	Squared Canonical Correlation
Consumer - Discretionary	0.467
Consumer - Staples	0.457
Energy	0.69
Financials	0.622
Health Care	0.64
Industrials	0.522
Information Technology	0.656
Materials	0.742
Telecommunications	0.773
Utilities	0.554

Economic Sectors are as defined in Table 1.

This correlation of the variable with its canonical variate is the simple correlation between them. A larger correlation implies a greater contribution of that variable to the linear combination from that set of variables. Typically a correlation is considered to be significant if it is 0.30 or higher (Haslem, et. al, 1992).

Table 4: Consumer Discretionary	
Panel A: Correlation of the CSP Variables with their Canonical Variable	
Total strengths	0.849
Total concerns	0.873
Panel B: Correlation of the CFP Variables with their Canonical Variable	
Earnings per share	-0.264
Operating income	0.775
Total assets	0.956
Total debt/total assets	-0.147
Return on assets	-0.067
Beta	-0.04
Annual return	-0.015
Price/earnings	-0.057
Market value/book value	-0.017
Variables are as described in Table 2.	

Table 5: Consumer Staples	
Panel A: Correlation of the CSP Variables with their Canonical Variable	
Total strengths	0.8
Total concerns	0.805
Panel B: Correlation of the CFP Variables with their Canonical Variable	
Earnings per share	0.201
Operating income	0.963
Total assets	0.934
Total debt/total assets	0.02
Return on assets	0.017
Beta	-0.289
Annual return	0.111
Price/earnings	0.159
Market value/book value	0.1
Variables are as described in Table 2.	

Table 6: Energy	
Panel A: Correlation of the CSP Variables with their Canonical Variable	
Total strengths	0.905
Total concerns	0.924
Panel B: Correlation of the CFP Variables with their Canonical Variable	
Earnings per share	0.512
Operating income	0.778
Total assets	0.81
Total debt/total assets	-0.223
Return on assets	0.107
Beta	-0.031
Annual return	0.135
Price/earnings	-0.049
Market value/book value	-0.016
Variables are as described in Table 2.	

Table 7: Financials	
Panel A: Correlation of the CSP Variables with their Canonical Variable	
Total strengths	0.83
Total concerns	0.86
Panel B: Correlation of the CFP Variables with their Canonical Variable	
Earnings per share	0.131
Operating income	0.798
Total assets	0.979
Total debt/total assets	-0.036
Return on assets	-0.036
Beta	0.241
Annual return	0.028
Price/earnings	0.009
Market value/book value	0.014
Variables are as described in Table 2.	

Table 8: Health Care	
Panel A: Correlation of the CSP Variables with their Canonical Variable	
Total strengths	0.923
Total concerns	0.833
Panel B: Correlation of the CFP Variables with their Canonical Variable	
Earnings per share	0.365
Operating income	0.975
Total assets	0.967
Total debt/total assets	-0.024
Return on assets	0.231
Beta	-0.283
Annual return	-0.092
Price/earnings	-0.04
Market value/book value	0
Variables are as described in Table 2.	

Table 9: Information Technology	
Panel A: Correlation of the CSP Variables with their Canonical Variable	
Total strengths	0.909
Total concerns	0.786
Panel B: Correlation of the CFP Variables with their Canonical Variable	
Earnings per share	0.111
Operating income	0.86
Total assets	0.763
Total debt/total assets	0.081
Return on assets	0.076
Beta	-0.058
Annual return	0.056
Price/earnings	0.057
Market value/book value	0.18
Variables are as described in Table 2	

Table 10: Industrials	
Panel A: Correlation of the CSP Variables with their Canonical Variable	
Total strengths	0.957
Total concerns	0.66
Panel B: Correlation of the CFP Variables with their Canonical Variable	
Earnings per share	0.119
Operating income	0.936
Total assets	0.994
Total debt/total assets	0.016
Return on assets	0.014
Beta	-0.011
Annual return	-0.033
Price/earnings	-0.044
Market value/book value	0.032
Variables are as described in Table 2	

Table 11: Materials	
Panel A: Correlation of the CSP Variables with their Canonical Variable	
Total strengths	0.94
Total concerns	0.826
Panel B: Correlation of the CFP Variables with their Canonical Variable	
Earnings per share	0.172
Operating income	0.712
Total assets	0.958
Total debt/total assets	-0.155
Return on assets	-0.005
Beta	-0.245
Annual return	0.001
Price/earnings	0.116
Market value/book value	0.069
Variables are as described in Table 2	

Table 12: Telecommunications	
Panel A: Correlation of the CSP Variables with their Canonical Variable	
Total strengths	0.979
Total concerns	0.864
Panel B: Correlation of the CFP Variables with their Canonical Variable	
Earnings per share	-0.088
Operating income	0.902
Total assets	0.934
Total debt/total assets	-0.242
Return on assets	-0.078
Beta	-0.026
Annual return	0.018
Price/earnings	-0.017
Market value/book value	0.178
Variables are as described in Table 2	

Table 13: Utilities	
Panel A: Correlation of the CSP Variables with their Canonical Variable	
Total strengths	0.741
Total concerns	0.917
Panel B: Correlation of the CFP Variables with their Canonical Variable	
Earnings per share	0.349
Operating income	0.905
Total assets	0.989
Total debt/total assets	-0.103
Return on assets	0.081
Beta	-0.225
Annual return	0.141
Price/earnings	-0.075
Market value/book value	-0.101
Variables are as described in Table 2	

Table 3 shows the squared (canonical) correlation between the canonical variate for the CSP variables and the canonical variate for the CFP variables. This is an estimate of the shared variance between the canonical variates from the two sets. It is analogous to the coefficient of determination (R^2) in multiple regression analysis.

As can be seen in Table 3, the strength of the relationship between the CSP measures and the CFP measures varies greatly across economic sectors. In this data set, the relation is weakest in the Consumer – Staples sector (0.457) and strongest in the Telecommunications sector (0.773). Across all sectors, the null hypothesis of no relationship is rejected at $p < 0.0001$ suggesting a significant association between the social and financial performance variables. The next step is to identify the variables from each set which are the most important.

Tables 4 through 13 show the correlation of each variable with its canonical variate, by economic sector. For the Consumer – Discretionary sector reported in Table 4, the KLD strengths and concerns are both important in representing the social actions of the firm. In looking for the important variables from the CFP set, the only financial variable that is significant is operating income. The remaining financial performance variables are not significant. For the control variables, only the size proxy (Total Assets) is significant. The risk measures, Total Debt / Total Assets and Beta are also not important.

The remainder of the tables can be interpreted in a similar fashion. From examining Tables 4 through 13, some generalizations can be made. First, within any sector, both strengths and concerns are important in measuring corporate social responsibility.

In all ten sectors, the only financial performance measure that is significant is operating income. Firm size is very important in the CSP/CFP relationship. This emphasizes the need to control for firm size in future research. The measures used as proxies for risk (Total Debt / Total Assets and Beta), however, are not important moderating variables in this study. The other control variable of interest, industry, is critical. The results differ, sometimes dramatically, across economic sectors. Further, as shown in Tables 3 through 13, the strength of the relationship between social and financial performance varies markedly across the sectors. This re-emphasizes the importance of controlling for industry effects in studies such as this. As future studies attempt to sort out the complex nature of the relationship between corporate social performance and corporate financial performance, it is clear that industry must be considered.

CONCLUSIONS AND LIMITATIONS

As with all empirical research, the results just identified are dependent on how well the measures operationalize the constructs of interest. In addition, in this study, the assumption is made that the year 2007 is a representative sample of the true nature of the relationship between social and financial performance. Also, the addition of the concerns and of the strengths across the seven issue areas assumes that they are equivalent. For example, the assumption is made that an environmental

strength is the same as a human relations strength or that a diversity concern is equivalent to a human relations concern.

In spite of these substantial limitations, this study supports the need to consider both strengths and concerns in measuring corporate social performance, and to keep the measures separate. As in prior research, this analysis highlights the importance of controlling for size and industry in CSP/CFP empirical studies. Finally, the results reported here suggest that operating income is a key financial performance measure. Operating income is often identified as the best long-term measure of a company's ongoing operations. By definition, it does not include non-operating revenues or expenses and it also does not include extraordinary items. This study provides empirical support for the importance of operating income as a financial measure of firm performance.

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Appendix A		
COMMUNITY		
	Strengths:	
		Charitable giving
		Innovative giving
		Non-US charitable giving
		Support for housing
		Support for education
		Indigenous peoples relations
		Volunteer programs
		Other strengths
	Concerns:	
		Investment controversies
		Negative economic impact
		Indigenous peoples relations
		Tax disputes
		Other concerns
CORPORATE GOVERNANCE		
	Strengths:	
		Limited compensation
		Ownership
		Transparency
		Political accountability
		Other strengths
	Concerns:	
		High compensation
		Ownership
		Accounting
		Transparency
		Political accountability
		Other concerns

Appendix A		
DIVERSITY		
	Strengths:	
		CEO
		Promotion
		Board of Directors
		Work/Life benefits
		Women and minority contracting
		Employment of the disabled
		Gay and lesbian policies
		Other strengths
	Concerns:	
		Controversies
		Non-representation
		Other concerns
EMPLOYEE RELATIONS		
	Strengths:	
		Union relations
		No-layoff policy
		Cash profit sharing
		Employee involvement
		Retirement benefit
		Health and safety
		Other strengths
	Concerns:	
		Union relations
		Health and safety
		Workforce reductions
		Retirement benefit
		Other concerns

Appendix A		
ENVIRONMENT		
	Strengths:	
		Beneficial products and services
		Pollution prevention
		Recycling
		Clean energy
		Communications
		Property, plant and equipment
		Management systems
		Other strengths
	Concerns:	
		Hazardous waste
		Regulatory problems
		Ozone depleting chemicals
		Substantial emissions
		Agricultural chemicals
		Climate change
		Other concerns
HUMAN RIGHTS		
	Strengths:	
		Positive record in South Africa
		Indigenous peoples human relations
		Labor rights
		Other strengths
	Concerns:	
		South Africa
		Northern Ireland
		Burma
		Mexico
		Labor rights

Appendix A		
		Indigenous peoples relations
		Other concerns
PRODUCT		
	Strengths:	
		Quality
		R&D / Innovation
		Benefits to economically disadvantaged
		Other strengths
	Concerns:	
		Product safety
		Marketing / contracting
		Antitrust
		Other concerns

EARNINGS MANAGEMENT: THE CASE OF SUDDEN CEO DEATH

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ABSTRACT

The topic of earnings management has broad appeal in both accounting and finance literature. Many of the existing studies on this topic try to determine if incoming CEOs manage earnings in the initial years of their tenures and an incoming CEO's motives for earnings management are different in voluntary versus involuntary turnover cases. Although prior studies have attempted to separate voluntary turnover events (planned retirement of outgoing CEO) from involuntary ones (firing of outgoing CEO) in their sample, criteria based on firm performance in the years immediately preceding the turnover cannot provide a precise distinction between the two, and have resulted in weak results from such studies. In our paper we study earnings management under the new CEO when the turnover is the result of the death of the predecessor. Thus, our study provides a cleaner setting for studying earnings management after CEO turnover. Our results show that the incoming CEOs who take over after sudden deaths of their predecessors manage earnings downward in the first full year of taking control. This result is in line with existing studies that document a tendency for the incoming CEOs to take an accounting big bath in the initial years of their tenure to give themselves a fresh start.

INTRODUCTION

In this paper we study earnings management after CEO turnover for the particular situation where the turnover is the result of the death of a CEO on job. Earnings management is a broad topic that has interested researchers in the areas of accounting, finance, strategy, and many other disciplines of social sciences where corporate governance is studied. But, the term earnings management means different things to different people depending upon their research focus. So it is worthwhile to define this term before going any further.

According to Healy and Wahlen (1999), "[i]f financial reports are to convey managers' information on their firms' performance, standards must permit managers to exercise judgment in financial reporting" (p.2). A frequently cited definition of earnings management from the same study states, "Earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the

underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers." (p.6) The Healy-Whalen definition leans towards an opportunistic view of earnings management whereby managers try to manipulate reported numbers for personal utility as predicted by Jensen's agency theory (Jensen and Meckling 1976, Jensen and Murphy 1990, Jensen 1993).

More recent accounting and financial literature has also shed light on the informational motive for this practice (for example, Holthausen and Leftwich 1983, Hand, 1989, Healy and Palepu 1993, Subramanyam 1996, Bartov et al. 2002, Ball and Shivakumar 2005). According to the information hypothesis, earnings management serves to reduce uncertainty around future earning potential of the firm and conveys managers' personal information about earnings quality to the external stakeholders allowing them to better forecast future performance of the firm. In popular business press, however, the term earnings management is frequently interpreted as a form of fraud[1].

Earnings management crosses over into the area of fraud only when managerial discretion to affect reported financial numbers is used in violation of Generally Accepted Accounting Principles (GAAP). Even though there is some evidence of a link between aggressive earnings management and fraud (Dechow, Sloan and, Sweeney 1996, Beneish 1999), our study does not deal with the incidences of outright fraud. The most commonly discussed forms of the legal earnings management practice are: income smoothing management or cookie jar accounting, income increasing management and, booking large losses or taking an accounting big bath. Our paper primarily deals with earnings management in the form of accounting big bath.

In this paper we use an accruals-based measure of earnings management. Accruals are the difference between reported income and cash flow for the period. In an ordinary course of business, net income may be different from cash flow for the period because of practices such as depreciation expense, receivables and payables. The portion of total accruals that is attributable to the normal business practices is termed non-discretionary accruals in the literature. But management can also take discretionary actions that change the size of total accruals. The discretionary accruals can result from a change in credit policy, an increase in loss reserves, or a change in inventory accounting practices, to name just a few possible methods. This style of earnings management is bound to reverse over time and mostly serves to time the recognition of a portion of earnings (profit or loss) in financial reports.

An interesting setting to study the incidence of this kind of earnings management is around CEO turnover. But existing studies on this topic suffer from the issue that they cannot cleanly separate voluntary turnover (retirement, voluntary change of job) from involuntary turnover (firing, corruption scandals, etc.) using publically available information. As we discuss below, the motives for earnings management (income increasing versus income decreasing) can be very different in voluntary versus involuntary turnover cases. In this paper we study the phenomenon of earnings management around CEO turnover when the turnover occurs as a consequence of the death of a CEO while on the job. This particular setup allows us to study this question without mixing data from voluntary and involuntary turnover cases. We, therefore, feel that our paper contributes

towards the extant literature on earnings management in a meaningful way. Consistent with the existing evidence relating accounting big bath phenomenon to CEO turnover, we find that incoming CEOs who take control of a firm after *sudden* deaths of previous CEOs make discretionary accruals decisions in the first full year of their tenure that decrease earnings.

The rest of this paper is organized as following: Section 2 provides a short summary of background literature on this topic. Sections 3 and 4 discuss the motivation and hypothesis development for this study, respectively. Sections 5 and 6 describe the method and data used in this paper. Section 7 discusses results of our analysis and section 8 concludes the paper.

LITERATURE REVIEW

The literature on earnings management is very extensive and dates back to the early seventies (Moore 1973, Strong and Meyers 1987, Elliot and Shaw 1988, Pourciau 1992). Most of the extant studies try to explain a CEO's motives of earnings management from two points of views: *opportunistic* perspective and *informational* perspective (for an excellent review of the existing work see Beneish, 2001).

From the opportunistic perspective, earnings management is related to compensation plan, costly contracting (Ball 1989, Healy 1985, Dye 1988) as well as ownership control (DeAngelo 1986, 1988). Under costly contracting hypothesis, managers manage reported earnings higher or lower to maximize the present value of their lifetime compensation and minimize the threat of getting fired. For example, in their seminal paper Murphy and Zimmerman (1992) argued that 1) CEOs approaching retirement will increase earnings in their final years at the expense of later years, 2) CEOs with threats of getting fired will manage earnings higher to cover up, and 3) new CEOs will take an accounting big bath to give themselves a fresh start. They found evidence of earnings management around management turnover only for poorly performing firms.

Kirschenheiter and Melmud (2002) showed that managers under-report earnings to the maximum possible, that is, they take an accounting big bath when actual earnings are low enough for the big bath to not hurt their compensation any further. They also showed that when the earnings news is good, management tries to smooth it over time. GodFrey, Mather and Ramsey (2003), using data on 63 Australian public companies, found evidence of upward earnings management and "impression management" a year after the CEO change. Their results were stronger for the instances where the CEO change could be deemed involuntary. Since it is very difficult to separate voluntary turnover from involuntary ones using publically available information, they used firm performance-based proxies to separate the two kinds of turnover in their data. Such categorization is imprecise and based on an arbitrary distinction between bad enough performance for the CEO to get fired versus good or not bad enough performance.

The relationship between CEO compensation and earnings management has been explicitly studied in the financial accounting literature both in relation to cash bonuses and stock based compensation (Healy 1985, Yermack 1997, Aboody and Kaznick 2000, Burns and Kedia 2004).

Among some of the recent papers relating accruals based earnings management to compensation or bonus plan of CEOs are Gao and Shrieves (2002) and Bergstresse and Philippo (2006). Both studies combined compensation information primarily from Standard and Poor's Execucomp database with accruals information derived from Compustat's financial statements' database. Gao and Shrieves found that the amount and intensity of management's stock based compensation are both positively related with the intensity of earnings management in the firm. Bergstresse and Philippo also found that earnings management is more pronounced in firms where the compensation of top management is more closely tied to the performance of companies' stock. They also found a positive link between higher accruals and unusually larger quantities of stock sale and exercise of stock options by the management.

Control motive for earnings management has been studied in the case of impending proxy war. Incumbent management will take huge losses to scare a possible acquirer or manage earnings upwards to reassure shareholders of its management capabilities. The same hypothesis implies that management may understate earnings before a management buyout but using accruals data DeAnglo (1986) finds no evidence in support of this notion.

From the information perspective, earnings management is also explained through noise reduction (Ball and Shivakumar 2005) and, conservatism in reporting gains (Basu 1997). Managers can use accruals to smooth out earnings to signal earnings' quality to debt-holders, and/or to signal low uncertainty in earnings to their shareholders. Since debt covenants can be costly to uphold and monitoring costs for creditors are very high, this aspect of costly contracting hypothesis can be looked at from an information perspective as opposed to the opportunistic perspective that applies to CEO compensation contracts. Ball and Shivakumar (2005) have developed a model to show that this kind of noise reduction earnings management is an optimal strategy for managers.

Earnings management is also done after the covenants are set to avoid financial distress for the firm. Dichev and Skinner (2000) found that many firms manage earnings to stay just above the threshold for violation of debt covenants. Sweeny (1996) as well as Defond and Jiambalvo (1994) found that management takes income increasing steps to delay default.

In the context of the current paper, this kind of earnings management and the resulting signaling effect may be important to the new CEO in his initial years because he does not have a history with the company and lacks credibility for his management style. A new CEO might be tempted to inflate earnings in his first few years in order to establish authority before internal and external stakeholders, and then allow the unavoidable reversal in the managed part of the earnings after gaining some job security.

Finally, conservatism in accounting implies that managers are quick to book large losses in reported earnings but reluctant to incorporate large gains until they are very certain about these gains over time. This asymmetric treatment of large gains versus large losses will cause an appearance of earnings management in reported earnings: during times of good performance, the reported earnings will look smoothed out over time and during bad performance periods it will create an accounting big bath kind of effect (for a detailed literature review on the topic see Basu, 1997).

MOTIVATION OF THIS STUDY

Our current study looks at earnings management around CEO turnover. Although this question has been studied before, our paper adds to the existing literature in two important ways. First, much of the previous research only used data of companies listed on the Fortune 500 or the S&P500 index, which may produce a sample selection bias in favor of large firms. The implied assumption in these studies is that the CEOs of very large companies manage earnings the same way as those of small companies do. However, such assumption may not hold because large firms are more minutely observed by financial analysts in the market than small firms. Thus, large firms may be tempted to take income increasing or income smoothing steps to beat analysts' forecasts (Burgstahler and Dichev 1997) instead of income decreasing steps.

In addition, the opportunities for large companies to smooth or inflate their earnings might be different from those for small companies. Small firms may have limited instruments of earnings management available to them. For example, large companies are more likely to have such items on their financial statements as goodwill or large pension plan related assets that allow them to manage earnings through goodwill impairment or a change of assumed rate of return applicable to pension fund related investments.

Second, the existing literature on earnings management has not clearly separated voluntary turnover instances from involuntary ones. A CEO that takes the helm after the previous CEO retires according to a predetermined plan may not be inclined to diverge from the policies of the outgoing CEO. The new CEO may have been nominated to take control sometime before the outgoing CEO's departure and there may be a grooming period during which the old CEO starts delegating authority to the new CEO. The incoming CEO can also be personally chosen by the outgoing CEO as part of routine turnover and therefore inclined to continue with the policies of the outgoing CEO to a very large extent. In these cases, it will be very difficult to find evidence for earnings management because the historical trend is most likely to continue or the change in policies will be too gradual to capture through limited publically available data.

On the other hand, earnings management is more likely to occur in the case of involuntary CEO turnover. When a CEO gets fired, the firm is typically in financial distress or the turnover is a consequence of some personal or accounting related scandal. If the firm is in financial distress, it creates opportunity and motive for the new CEO to book as much loss as possible in his initial years to "clear the decks" as such and start fresh. It is more likely that the new CEO will not follow the policies of the outgoing CEO and it becomes possible to find evidence of earnings management with a change of trend in the data. If incoming CEOs in voluntary turnover instances tend to manage earnings upward and those in involuntary cases take an accounting big bath, combining data from both cases may not allow researchers to draw clearer inferences.

In order to tackle this issue, researchers have attempted to separate voluntary turnover from involuntary turnover using criteria based on the past performance of a firm immediately before its CEO change. The presumed connection between firm performance and involuntary CEO turnover

leaves out other possible reasons of such turnover such as fraud or personal scandal. It is also fraught with the "chicken and egg" problem. To illustrate, some good CEOs may leave voluntarily when they see limited growth potential of a firm due to its bad performance for reasons beyond their control. It is also not unheard of for a CEO of a badly performing firm to stay on the job until routine retirement.

Our paper provides a cleaner setup to study earnings management around CEO turnover. Our sample consists of all the publically listed US companies who had a turnover event due to CEO death on the job from 1988 to 2008. This way, we restrict our sample to involuntary CEO turnovers and avoid arbitrarily separating voluntary turnover instances from involuntary ones based on ambiguous criteria. It also reduces the selection bias toward very big or very small companies in our sample. We, therefore, think that our study is an important addition to the existing literature on earnings management.

HYPOTHESES DEVELOPMENT

In line with the existing literature, ex-ante, we expect to find evidence of earnings management through discretionary accruals in the initial period of incoming CEO's tenure. The direction of this earnings management can be, based on the theories discussed earlier, either income increasing (positive discretionary accruals) or income decreasing (negative discretionary accruals). If the new CEO wants to create a favorable first impression before all the stakeholders, including shareholders for any possible future proxy contests, debt holders for optimal debt contracts and immediate subordinates for their support in implementing new policies, one may try to manage earnings higher in the first few years of taking power. On the other hand, one may also have an incentive to take a big bath in the first year to set the expectations lower for subsequent years and hence increase the probability of receiving performance based compensation by exceeding those lowered expectations. Such big bath behavior can also allow the incoming CEO to disentangle oneself quickly from the problems of the outgoing CEO and take a fresh start. We, therefore, propose a pair of competing hypotheses from both perspectives as follows:

H1a: Firms report larger than normal income increasing discretionary accruals in the first year of new CEO's tenure and the direction of earnings management will reverse in the following year(s).

H1b: Firms report larger than normal income reducing discretionary accruals in the first year of new CEO's tenure and the direction of earnings management will reverse in the following year(s).

Although it is involuntary when CEO turnover is the consequence of previous CEO death on the job, the incoming CEO may manage earnings differently if the previous CEO died suddenly

versus not suddenly. When the CEO of a firm dies suddenly, the incoming CEO will have more of an incentive to take a big bath in the first fiscal year of taking control so that he can take a fresh start. In the case of a CEO dying after suffering from chronic illness, the firm might have a succession plan in place and the new CEO might be actively involved in his leadership role while the previous CEO was alive. Alternatively, he might be handpicked by the previous CEO and thus share the same leadership philosophy as the deceased CEO. In either case, we expect to see a smaller change in earnings management style in the first year of the incoming CEO's tenure for the cases when the previous CEO died of causes we cannot categorize as sudden. Thus, we propose:

*H2: Firms report larger income reducing discretionary accruals in the first year of new CEO's tenure if the previous CEO died **suddenly** than **not suddenly**.*

In addition, if the CEO is suffering from potentially life-threatening problems, he may be tempted to manage earnings upwards to create the impression of higher profitability for the firm during his final years for egotistical reasons (legacy concerns) or, to increase the value of his pension and stock options related compensation at retirement. Thus, we propose:

H3: Firms report larger income increasing discretionary accruals in the last full fiscal year under the deceased CEO when the CEO died after some period of illness (death events tagged "not sudden").

METHOD

The use of accruals to study earnings management is quite well established in the business literature. It is not only used in accounting studies extensively, but it has been increasingly used to study many finance or strategy related topics. For example, recent papers by Raman, Shivakumar and Tamayo (2008), Louis (2004) Guo, Liu, and Song (2007) used the accruals-based Jones (1991) model in the mergers and acquisition context. This model aims at separating discretionary accruals (DA) from non-discretionary accruals (NDA) present in the total accruals (TA) of a firm. According to this model NDA is related to sales growth (or sales change) which captures the economic environment facing a firm and also captures accruals arising out of sales related items directly (e.g., receivables, payables, inventory cost for products not yet sold). Because a large part of the difference between reported income and cash flow of a firm occurs due to depreciation, the Jones model also relates NDA with gross physical plant and equipment (PPE).

Dechow, Sloan and Sweeney (1995) argued that management has greater discretion over the credit portion of sales and modified Jones model to incorporate change in sales net of change in receivables for the period. Kothari (2005) has shown that the Jones and Modified Jones models, without correcting for prior performance, may result in severe measurement error. Kothari suggested adding a variable like the lagged value of ROA to control for prior performance. Consequently, we

use the following form of the modified Jones model on times-series cross-sectional panel of the firms in our sample using fiscal-yearly data:

$$TA_{t,j} = b_0 + b_1 \text{ Company indicator}_j + b_2 \text{ Industry indicator}_j + b_3 \text{ Year indicator}_j + b_4 PPE_{t,j} + b_5(\text{Äsales}_{t,j} - \text{Äreceivables}_{t,j}) + b_6 ROA_{t-1,j} + b_6 \text{ Relative-year dummy}_j + e_{t,j} \quad (1)$$

Where:

t specifies time and *j* denotes company;

$TA_{t,j}$ is total accruals for company *j* at time *t* scaled by assets at time *t* ; that is, (income before extraordinary items – operating net cash flow)/total assets at time *t*, or, in COMPUSTAT mnemonics: (IBC-OANCF)/AT;

$PPE_{t,j}$ is gross plant and equipment for company *j* at time *t* scaled by assets at time *t*,

$\text{Äsales}_{t,j} - \text{Äreceivables}_{t,j}$ is change in sales less change in receivables for the same period, both scaled by assets at time *t*;

$ROA_{t-1,j}$ is Lagged value of return on assets;

Relative year dummies area set of indicator variable that represent fiscal year relative to the first year under the new CEO's control. There are six such possible variables (used one at a time in a regression model): new CEO year 1, new CEO year 2, new CEO year 3, previous CEO's last year, previous CEO's second last year and, previous CEO's third last year;

Company, industry and year indicators are linear variables to control for company, industry and calendar year specific intercepts. Because of a large number of companies and calendar years in the panel data and limited size of the overall data, we could not use dummy variables in the fixed effect model sense to control for these effects;

$e_{t,j}$ is regression residual or remaining discretionary accruals for firm *j* at time *t*, after controlling for relative year dummy variables.

We implement the above model for the whole data set as well as separately for the subsamples of companies whose CEOs died suddenly versus not suddenly.

DATA

We collected data on death news of CEOs of U.S. companies by searching Lexis-Nexis, Proquest and Google News on combinations of keywords involving words such as "CEO", "chief

executive officer" together with "death", "dead", "dying", "passed away" or "obituary" for the period 1988-2008. We tagged a death event as "sudden" if the context of the news story implied so.

Our initial search yielded 216 distinct events for this period. Due to the data availability, we eliminated private and public administration firms. In keeping with the existing literature, we also excluded all financial firms (SIC code starting with 6). Finally, we found 76 non-financial firms included in Research Insight's "Compustat North America" database. Of these 76 firms, we found data only on 52 firms that spanned at least five years (3 years under the new CEO and 2 under the old). In the rare event that a firm had two CEO death events in the sample period, we excluded the later event from the sample. When a larger amount of data was available on Compustat for any company, we limited the time series included in our sample to a maximum of five years under the incoming CEO and five years under the predecessor. From the final sample of 52 firms, 21 of the death events were coded as "sudden" according to the context of the news story and the rest were deemed not sudden. Table 1 provides the industry and yearly breakdown of the firms in our sample. We acknowledge the small sample size of our study in terms of the number of firms included but due to the nature of the event setting, this problem is typical of such studies. In terms of time series, we did not want to extend the sample period too far forward or backwards relative to the death event because of significant changes in accounting rules over time and the possible presence of other confounding events.

Since the death events occurred somewhere in the middle of each firm's fiscal year, an important data question to answer before implementing our model is how to code relative year dummies, in other words, how to determine how long in a fiscal year should a new CEO be in office for that year to be deemed under his management control at the onset of the turnover. We came up with an ad-hoc answer to this question: if the previous CEO died more than six months into a fiscal year, we gave that year to the previous CEO and called it *previous CEO's last year* and the next year *new CEO's year 1* and labeled other dummy variables accordingly. Similarly, if a CEO died less than six months into a fiscal year, we called it *new CEO's year 1* or the first fiscal year for the new CEO and coded years before and after accordingly.

In the accounting literature, the Jones model is sometimes applied on individual companies in firm level regressions even in cases when the number of time series data points is severely limited. Even in the seminal Jones (1991) paper, the cutoff for inclusion of a firm in the sample for running individual firm level regressions is the availability of *six* or more data points. Although we do not feel comfortable performing our main analysis this way due to too few firm years for some of sample firms, we did verify our results by running individual firm level regressions as a robustness test to calculate discretionary accruals from modified Jones model and then pooling the resulting discretionary accruals for analysis on relative year effect. The results are consistent with those we reported in the paper.

Table 1: Death Event Frequency for the Complete Data Set		
By Industry (SIC first digit)	Frequency	Percentage
Mining / Construction (1)	1	1.92
Manufacturing (2&3)	29	55.77
Transportation, Communications, Electric, Gas, And Sanitary Services (4)	4	7.69
Wholesale / retail (5)	9	17.31
Service (7&8)	9	17.31
By Year	Frequency	Percentage
1988	3	5.77
1989	2	3.85
1991	2	3.85
1992	1	1.92
1994	3	5.77
1995	2	3.85
1996	1	1.92
1997	3	5.77
1999	4	7.69
2000	4	7.69
2001	2	3.85
2002	5	9.62
2003	5	9.62
2004	6	11.54
2005	2	3.85
2006	4	7.69
2007	3	5.77
Sudden vs. Non Sudden	Frequency	Percentage
Sudden	21	59.62
Non Sudden	31	40.38

In terms of company characteristics (firm size, industry affiliation, etc.), the type of firms included in our sample are completely determined by the event occurrence (CEO death). The only restrictions we imposed were that the firms must be US, publically listed and be non-financial. Accounting standards are so different across countries that it is not possible to pool US with non-US firms in one sample and therefore we intend to conduct analysis on such firms in separate studies. The financial information of the firms in the sample was obtained from Standard and Poor's Research Insight COMPUSTAT North America database. Forty-three firms from the sample were

listed as "active" on COMPUSTAT and the rest were "inactive". Our final sample consisted of an unbalanced panel data of 563 firm years. Table 2 gives descriptive statistics on the firms during the first year under the new CEO's term. The mean size of Sales and Gross Physical Plant and Equipment (PPE) in the first year for our sample firms is $3.7 billion and $2.9 billion, respectively. The mean value for lag ROA for the sample is negative 2%. Our sample contains some very large firms such as McDonalds Corp. and the Coca Cola Company and many smaller firms.

Table 2. Descriptive Statistics of the Complete Data Set for the First Year of New CEO's tenure

Variable	N	Mean	Std. Dev.	Min.	Max.
PPEG	52	2897.46	7408.48	.10	39546.00
Sales	52	3686.97	8166.28	0	51209.00
Assets	52	4082.39	8277.71	1.75	38426.00
Accruals	52	-234.79	658.18	-4112.00	96.00
Receivables	52	518.18	1232.29	.02	7689.00
ROA	52	-.02	.36	-2.29	.44
ΔSales	52	144.02	738.07	-2471.00	2813.00
ΔReceivables	52	15.83	210.96	-63.00	878.00

Table 3. Pearson Correlation Matrix

	Accruals/assets	PPE	Äsales-Äreceivables	ROA_{t-1}
Accruals/assets	1			
PPE	-.175**	1		
Äsales-Äreceivables	.279**	-.367**	1	
ROA_{t-1}	.216**	-.032	.081	1
New CEO year 1	.008	-.010	.004	.008
New CEO year 2	-.090*	.012	-.001	-.020
New CEO year 3	-.042	.018	-.066	.005
Pre. CEO last year	.042	-.017	-.010	-.022
Pre. CEO last second year	.007	-.020	.005	-.038
Pre. CEO last third year	-.008	-.036	.019	-.034

**: Significant at the level of .01 (two-tailed)

*: Significant at the level of .05 (two-tailed)

Note: The correlations between the dichotomic variables (new CEO year1, new CEO year2, new CEO year3, previous CEO last year, previous CEO last second year, and previous CEO last third year) are not reported because they were entered into the regressions separately.

Table 3 provides correlation among variables as used in the analysis. We standardized dollar denominated variables by the amount of total assets for the year in the regressions. The correlation matrix does not indicate any potential mulitcollinearity problem for all the variables that are present in our regressions at the same time.

RESULTS AND DISCUSSION

We ran regressions on three different data sets: all 52 firms together, the subsample of 21 firms with sudden CEO death events and the subsample of 31 firms with non-sudden death events. For each dataset we ran individual regressions using one form of relative year dummy variable at a time. The major results are presented in Tables 4, 5, and 6. For all versions of our model and for all subsamples the coefficients on variables from Modified Jones Model were significant. The adjusted R square for all versions, although low, was also in line with previous studies that used Jones and Modified Jones models. Below we will discuss the results in detail.

Table 4 presents the results for the full sample. The table shows that the coefficient for *New CEO year 1* is positive and insignificant but the coefficient for New CEO year 2 is negative and significant at the five percent level. The results do not support either Hypothesis H1a or H1b, which predicts earning management would take place during the first year of the incoming CEO's tenure. However, this ostensibly gives evidence that all incoming CEOs actually took an accounting big bath one year after taking the helm. This result may be due to our arbitrary assignation of the beginning year of incoming CEOs. As we mentioned before we decided the first year of a new CEO's control based on a subjective criterion: if the new CEO had more than six months in the year of death event, it was labeled his/her year 1; otherwise, the next year was labeled his year 1. That coding system assigns partial years as year 1 in many cases. Regardless of a set criterion, the actual time period required to gain full control in a firm might also be different in different firms for very unique reasons. Although this division is arbitrary and far from perfect, it may only change the year number in which the earnings management happened as our results suggested, rather than the underlying evidence of earnings management. In addition, any other cutoff period to determine year 1 would have been just as subjective and would also cause some anomaly along the same line. In unreported results we did try other cutoff periods and the main result of our analysis did not change much.

Interim CEO is another issue that may confound our analysis. If an interim CEO is chosen and the new long term CEO takes office after some period, this process may reduce the statistical significance of our results. But the data used in the present form will not systematically bias our results in favor of our hypotheses and therefore we feel justified in using our current data. We did, however, try to gather data on the presence and length of stay of interim CEOs in our sample. But, we found data on less than half of our sample firms. For those with available information on interim CEO, the interim's term (if any) was less than three months.

Table 4. Linear Regression Results with the Complete Data Set (Sudden and Non-Sudden)							
Variable	***1***	***2***	***3***	***4***	***5***	***6***	***7***
Company indicator	-.000	-.000	-.000	-.000	-.000	.000	-.000
Industry indicator	-.005	-.005	-.005	-.005	-.005	-.005	-.005
Year Indicator	-.001	-.001	-.001	-.001	-.001	-.000	-.000
PPE	-.030*	-.030*	-.030*	-.030*	-.030*	-.030*	-.030*
Äsales-Äreceivables	.084***	.084***	.085***	.084***	.085***	.085***	.085***
ROA_{t-1}	.108***	.108***	.107***	.108***	.109***	.108***	.108***
New CEO year 1		.005					
New CEO year 2			-.042*				
New CEO year 3				-.014			
Pre. CEO last year					.026		
Pre. CEO last second year						.006	
Pre. CEO last third year							-.006
N	563	563	563	563	563	563	563
Adj. R^2	.124	.122	.128	.123	.124	.122	.122
Ä R^2		-.002	.004	-.001	0	-.002	-.002
F-Statistics	14.19***	12.15***	12.81***	12.21***	12.40***	12.16***	12.16***
*** Significant at the level of .001 ** Significant at the level of .01 * Significant at the level of .05							

Further, we conducted analyses using the two subsamples and the results are shown inTable 5 and Table 6. Our results reveal that the big bath phenomenon only occurs in firms where the previous CEO died *suddenly*. When the sample is subdivided into sudden and not sudden CEO death events, the coefficient on New CEO year 2 is positive and insignificant but for the sudden death sample, the coefficient on the same variable is negative and becomes significant. This finding is consistent with the earlier discussion that the reasons for earnings management are possibly different for voluntary versus involuntary turnover instances. If the previous CEO was facing some health related issues in his last years as CEO, it is probable that a succession plan has been in place and old CEO's policies are likely to continue at least for a while after the change. Even if some form of earnings management occurs in this scenario, it is not possible to detect the subtle and graduate manipulation for a particular year using the modified Jones or similar models. On the other hand, the situation where the previous CEO died suddenly on the job provides a much cleaner setting to detect earnings management and our results suggest the same.

Table 5. Linear Regression Results with the Sudden Death Data Set

Variable	*8*	*9*	*10*	*11*	*12*	*13*	*14*
Company Identification	-.001	-.001	-.001	-.001	-.001	-.001	-.001
Industry indicator	.005	.005	.005	.005	.005	.005	.005
Year Indicator	-.003	-.002	-.001	-.002	-.002	-.002	-.002
PPE	-.040*	-.040*	-.039*	-.040*	-.040*	-.040*	-.040*
Äsales-Äreceivables	.064**	.064**	.064**	.063**	.064**	.063**	.064**
ROA_{t-1}	.102**	.102**	.102**	.102**	.102**	.103**	.102**
New CEO year 1		.016					
New CEO year 2			-.121**				
New CEO year 3				-.012			
Pre. CEO last year					-.008		
Pre. CEO last second year						.024	
Pre. CEO last third year							.010
N	213	213	213	213	213	213	213
Adj. R^2	.142	.138	.178	.138	.137	.139	.138
Ä R^2		-.004	.036	-.004	-.005	-.003	-.005
F-Statistics	6.82***	5.85***	7.57***	5.83***	5.83***	5.89***	5.83***

*** Significant at the level of .001
** Significant at the level of .01
* Significant at the level of .05

We did not find strong evidence in support of the reversed direction of earnings management after the first couple of years under the new CEO's control. The coefficient for *New CEO year 3* is less negative for the sudden death subsample and it reverses sign compared to *New CEO year 2* for the not-sudden death sample but these coefficients are all insignificant. In particular, the fact that the coefficient on *New CEO year 3* is not positive for the sudden death sample implies that the reversal happens much more gradually than what we expected.

Our third hypothesis concerned earnings management during the previous CEO's last year on the job when he/she died of causes that could not be deemed as sudden. We expected the outgoing CEO to try to manage earnings higher in the last years. Table 6 shows that we have

significant results (at five persent level)) in favor of this hypothesis. Although, the coefficient for *New CEO year 1* is also positive (but insignificant) for this subsample, the absolute size of the coefficient is much bigger (and significant) for the previous CEO's last year than that on *New CEO year 1*.

Table 6. Linear Regression Results with the non-Sudden Death Data Set

Variable	***15***	***16***	***17***	***18***	***19***	***20***	***21***
Company Identification	-.000	-.000	-.000	-.000	-.001	-.000	-.000
Industry indicator	-.011**	-.011**	-.011**	-.011**	-.011**	-.011**	-.011**
Year Indicator	.001	.001	.001	.001	.001	.001	.001
PPE	-.045	-.045	-.045	-.045	-.046	-.045	-.045
Äsales-Äreceivables	.150***	.150***	.150***	.155***	.154***	.150***	.150***
ROA_{t-1}	.035	.035	.035	.038	.041	.035	.033
New CEO year 1		.002					
New CEO year 2			.008				
New CEO year 3				-.032			
Pre. CEO last year					.051*		
Pre. CEO last second year						.000	
Pre. CEO last third year							-.017
N	319	319	319	319	319	319	319
Adj. R^2	.091	.089	.089	.093	.102	.088	.090
Ä R^2		-.002	0	.002	.011	-.003	-.001
F-Statistics	6.33***	5.41***	5.43***	5.66***	6.15***	5.41***	5.49***

*** Significant at the level of .001
** Significant at the level of .01
* Significant at the level of .05

For the results presented above, we included fiscal year 2008 data in the analysis whenever it is available and is part of our ten-year maximum range for a company. But the economic conditions in year 2008 were significantly different from the previous years and that has the potential to influence our results even when controlling for calendar year. To rule out this possibility, we reran all our analysis without any data after FY2007 and excluded all the firms with insufficient post death data as a consequence. This truncation did not substantially change the conclusions drawn in the previous section.

As mentioned before, we also checked our results using individual firm level regressions to estimate discretionary accruals and our results did not change. Among many other robustness checks

related to issues such as changing the maximum and minimum number of years allowed for each company in the sample, we also tested for each individual company in the sample unduly influencing our results by running models excluding each company or a random small subset of companies in turn. We did not find any single or a few companies driving our results.

CONCLUSION

In this paper we explore whether incoming CEOs actively manage reported earnings immediately after taking office for a unique sample of companies where the turnover was the result of previous CEO's death. This special setting allows us to study the question of earnings management around CEO turnover without subjectively separating voluntary from involuntary turnover cases. Apart from running analysis on all firms in our sample with a CEO death event, we further separate the firms with sudden CEO deaths from those with non-sudden deaths, and run analysis on both subsamples. Our results show that incoming CEOs who take control after the sudden death of their predecessor exhibit accounting big bath behavior in the initial period of taking control. This phenomenon is not seen among new CEOs in non-sudden death event cases.

ENDNOTE

[1] The following is from a speech given by the SEC Director Richard Walker, "Our message deploring the practice of earnings management has been forcefully delivered and is being embraced, I believe, by responsible practitioners and issuers […] If you're not persuaded by class action statistics that the incidence of financial fraud is on the rise, consider what no less an authority than Warren Buffett has said on the subject of earnings management. In his most recent letter to Berkshire Hathaway shareholders, Mr. Buffett states, and I quote, "a significant and growing number of otherwise high-grade managers – CEOs you would be happy to have as spouses for your children or as trustees under your will – have come to the view that it's okay to manipulate earnings to satisfy what they believe are Wall Street's desires." " (December 1999, http://www.sec.gov/news/speech/speecharchive/1999/spch334.htm)

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INTRADAY STUDY OF THE MARKET REACTION TO DISTRIBUTED DENIAL OF SERVICE (DOS) ATTACKS ON INTERNET FIRMS

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ABSTRACT

This study investigates the market reaction to distributed denial of service (DoS) attacks on internet firms and the information transfer affecting the market value of non-attacked internet and internet security firms. We use the portfolio approach to examine the market impact of DoS attacks and we contribute to this stream of literature by using intraday data obtained from the NASTRAQ database. We find evidence for trading volume of firms being adjusted for DoS attacks but mixed results for firm returns.

INTRODUCTION

Computers have become an integral part of our personal and professional lives. Some companies in fact conduct all of their business solely through the use of computers; these firms are referred to as "internet firms." Denial of access to computer networks even for a brief period of time can result in a loss of business and can be devastating to internet firms. Distributed denial of service (DoS) attacks on internet firms encompass all conditions that deliberately prevent users from accessing network resources through which the firms conduct business, including the sale and purchase of products and access to data for various reasons. The attacks may also go beyond shutting down websites; it may damage computer software and systems, and compromise firm and customer data.

During a DoS attack, internet firms lose revenue and also suffer the consequences of exposure to their inherent "vulnerability" with permanent loss of future revenue (some customers shy away from internet businesses after news of a hacker attack). Using *e-Bay* as an example, Duh et al. (2002) show that concern over online security is a major impediment to the growth of internet businesses. They find that DoS, privacy, and authentication are three major sources of business risk for internet firms.

The impact of DoS attacks on market reaction remains questionable. Several studies have examined the market reaction of such attacks; the findings, however, are inconclusive. Hovav and D'Arcy (2003) and Hovav, Andoh-Baidoo and Dhillion (2007) find that the market does not

significantly penalize internet companies that experience a DoS attack. Ettredge and Richardson (2003), Cavusoglu, Mishra and Raghunathan (2004), and Anthony, Choi and Grabski (2006), on the other hand, find a negative market reaction to internet firms that experience web outages. Each of these studies used an event study methodology and daily returns data. Telang and Wattal's (2007) examination of the impact of vulnerability announcements on security software vendors reveals that these companies do suffer a drop in their stock prices.

The purpose of this study is to further examine the relation between DoS attacks and market reaction. We build on the study by Ettredge and Richardson (2003) and examine the effects of the same DoS attacks at an intraday level using data obtained from the NASTRAQ database. Using intraday data further allows us to investigate the extent to which the DoS victim's stock prices are affected and the related length of time. Additionally, we analyze the impact of DoS attacks on other firms in the same industry by way of information transfer. We hypothesize that a DoS victim's stock will trade heavily; this increase in trading volume will become "news" resulting in an increase in trading of other stocks in the same industry. Furthermore, we examine the extent to which a DoS attack affects the stock price of Internet Security Provider (ISP) firms at an intraday level.

Our study advances the current knowledge of literature by using intraday data. This data is advantageous since the NASDAQ market price adjusts rapidly to new information on DoS attacks. The NASTRAQ database, which is intended for academic research, contains trades and quotes for NASDAQ stocks. The data must be extracted into spreadsheets. This poses a major difficulty with the large volume of trading data within the short window of interest in this paper. The seminal paper by Ball and Brown (1968) shows that the market does not adjust fully to new information and leads to a post announcement drift. Therefore, we examine the market adjustment to a DoS attack, on an intraday basis as trading occurs, and the cost of security in terms of price adjustment to firms in the industry that have not been attacked. Another significant contribution of this research will be the study of information transfer based on trading volume.

LITERATURE REVIEW

The rational pricing and market value of internet firms has been studied extensively. Schwartz and Moon (2000) find that high growth rates in revenues appear to justify astronomically high prices of technology firms during the internet bubble. This finding is reinforced by Kamstra (2001). He finds that the value of an internet firm can be determined by revenue, if the revenues are co-integrated with fundamental value. Lazer et al. (2001) also show that internet websites with higher traffic rates provide significantly higher returns than sites with low internet traffic. Therefore, a DoS attack that reduces the revenue of the internet firm directly by obstructing transactions and diminishing customer confidence in the firm's trading platform can have a major impact on its market value.

The market impact of different disclosures by internet trading firms has been widely analyzed in the accounting and finance literature. Subramani and Walden (2001) analyze the impact

of e-commerce initiative announcements and find significant positive cumulative abnormal returns to investors. This result reveals that the market recognizes e-commerce events as value relevant in determining the market value of internet companies.

Several prior studies report a negative association between market value and web outages. Ettredge and Richardson (2003) study this DoS phenomenon over a three-day period, February 7, 2000 to February 9, 2000, and find that internet firms suffer a significantly negative stock market reaction even when the firm is not subject to the DoS attack. They also find that Internet Security Provider firms benefited from these hacker attack events. Cavusoglu et al. (2004) conduct a large-scale study on all types of security breaches (not just DoS attacks) over a seven-year period, 1995-2001. They find a negative relation between internet security breach announcements and market value, regardless of the type of security breach. Anthony et al.'s (2006) study of the stock market reaction to announcements of website outages further report that internet firms have negative returns when they experience internet outages.

Other studies, however, report that DoS attacks did not impact market value. Hovav and D'Arcy's (2003) study of DoS attacks over a 4.5 year period reveals that while internet firms had negative abnormal returns during the five days following the announcement, they were not significant. Hovav, Andoh-Baidoo and Dhillion (2007) further explore whether various characteristics of security breaches impact abnormal stock returns. This study examines the type of attackers, objectives of the attack, the results of the attack, tools used to attack and the access type. They report that not all attacks have the same effect on abnormal returns. While the overall end result of the attack had a significantly negative impact on market reaction, DoS attacks, a category within end result, did not.

All these studies employ the event study methodology using daily data. Event studies do not rely on expectations of accounting numbers but adjust a firm's expected returns to a systematic measure of risk, such as beta. Studies cited in Kothari (2001) show that short term event studies are usually consistent with market efficiency. The studies on market efficiency utilizing event study methodology face a variety of econometric issues that are summarized in Kothari (2001), such as expected returns mismeasurement, unusual and correlated samples of firms' returns, survivorship bias, clustering in calendar time, bias in the test statistics, model specification (such as the choice between price and returns models), and the comparison of the information content of alternative models. The incremental information content of a particular accounting signal can be analyzed by including a dummy variable for the accounting signal in a cross-sectional or time series study.

The event study methodology, as used by Ettredge and Richardson (2003), is not robust to clustering, which occurs when a significant number of the events take place within a short period of time. Harrington and Shrider (2007) also show that a short horizon event study ignores cross-firm variation in the event effects, thereby inducing a bias in the abnormal returns. Since DoS attacks by their dissimilarity and severity will induce cross-firm variations on their effects across other internet firms, we have expanded the dataset to use intraday data instead of daily data. Furthermore, in order

to overcome these issues and improve the robustness of the results of the study, we utilize the portfolio approach.

All of the above methodologies rely on a returns metric to determine the market impact of the DoS attack. Cready and Hurtt (2002), however, show that a volume based metric to measure investor response provides more powerful tests than the measures based on abnormal stock returns in the event studies. Cready and Hurtt (2002) also show that the power of a returns based metric test can be improved by incorporating a trading (volume) based measure. We hypothesize that after a DoS attack the increased trading volume of the victim's stock will cause investors to trade other stocks in the same industry. That is to say, the reaction is to the increased trading volume and not to the DoS attack event. Therefore, we will conduct additional tests to detect investor responses based on event day trading volumes.

HYPOTHESIS DEVELOPMENT

In this section, we present the hypotheses that are examined in this study. First we study the firm effect of a DoS attack. Yahoo suffered a service failure that lasted nearly three hours when computer hackers flooded Yahoo's network with a steady stream of data. Yahoo received nearly one gigabyte of traffic per second for three hours; this was estimated to be more data than most firms received over a one year period. This information overload prevented Yahoo from exchanging data with its customers and effectively shut down their site. While analysts did not expect Yahoo's revenues to suffer, this DoS attack was more than merely an inconvenience to the customers. The hackers sent a larger message that nobody's computer was safe. Unfortunately, this was just the start of the attacks; eBay and Amazon soon became victims too. Most DoS attacks are hard to trace, as hackers use several computers to perpetuate the crime. In most cases, the computer used to cause the attacks is hijacked through the internet.

If a DoS attack prevents firms from conducting business, the firms will lose revenue. Knowledge of the DoS attacks may also deter customers from conducting business online in the future. As such, firm value will be negatively affected by DoS attacks. Therefore, our first hypothesis is the following:

H_1: *The stock price of an internet firm will be negatively affected by a DoS attack.*

Next we explore the impact of DoS attacks on Internet Security Providers (ISP) firms. DoS attacks draw attention to the vulnerability of internet firms and raise the demand for increased security on the internet. The demand for increased security will be predicated by the services provided by ISP firms. Accordingly, DoS attacks will result in higher revenue and an awareness of the need for ISP firms. Therefore, our second hypothesis is the following:

H_2: *The stock price of an ISP firm will be positively affected by a DoS attack in the internet industry.*

Lastly, we investigate the impact of DoS attacks on market reaction based on trading volume. If the market is frightened by a DoS attack, investors will not purchase shares of the attacked firm's stock. On the other hand, if the market is not frightened by the DoS attack, investors will hold their stocks rather than sell them. Accordingly, regardless of the market reaction to the DoS attack, investors will not purchase additional stocks during the attack period. Therefore, trading volume will decrease during the attack period. Using intraday data we expect that unsophisticated investors will react to the DoS attack while sophisticated investors (larger percentage of investors) will not immediately react to the attack. Our third hypothesis is the following:

H_3 *The trading volume of a firm subject to a DoS attack will decrease during the attack period.*

DATA AND METHODOLOGY

Data

The sample for this study consists of the three NASDAQ firms, Yahoo, eBay and Amazon.com, that experienced DoS attacks during the period February 7 – 9, 2000. Of the eight firms attacked during this period, five were excluded from our study for the following reasons: three firms were not listed (CNN, ZDNet and Excite), one firm (E*Trade) was listed on the NYSE, and one firm (Buy.com) went public on the same day it was attacked. Daily trades, volume and stock prices for February 2000, are obtained from the NASTRAQ database. The time and duration of DoS attacks in February 2000 and the NASDAQ market's trading hours are provided in Table 1 below. It is important to note that only the Yahoo attack took place entirely within the regular trading hours; the attack on eBay started during the regular trading hours and continued to the extended hours and later; and the Amazon attack started after the close of extended trading hours. This small sample size and the proximity of the attacks limit our ability to control for the market time in which the attack occurs.

The sample firms examined in this study are very unique. Yahoo, eBay and Amazon are industry leaders, and are much larger than other firms in the same industry. Due to the uniqueness of the sample firms, it is difficult to establish a control sample based on firms in the same industry with similar characteristics, such as market size, sales and assets. Therefore, to measure abnormal returns we use a control sample of internet firms that did not experience a DoS attack during the sample period. Our control sample consists of these same internet firms examined by Ettredge and Richardson (2003). They found that information transfer was no different in industries where internet firms were attacked than in internet industries not attacked. Likewise, we use the internet

firms that were not attacked as the control sample to measure abnormal returns related to internet security providers. Our control sample consists of 134 internet firms listed on www.InternetStockList.com as of July 2000. The control sample was obtained from Professor Richardson. The internet security provider sample consists of 10 firms that provide internet security products and services.

Table 1: Attack Periods and Trading Hours

Panel A: Denial of Service Attack Periods

Date	*Firm*	*Start*	*End*
40580	Yahoo	0.42708333333	0.61458333333
40581	eBay	0.60416666667	0.8125
40581	Amazon	0.70833333333	0.86458333333

Panel B: NASDAQ Market Trading Hours

	Open	*Close*
Early Trading Hours	0.33333333333	0.39583333333
Regular Trading Hours	0.39583333333	0.6875
Extended Trading Hours	0.6875	0.77083333333

Table 2: Descriptive Statistics (in $millions)

	n	*Mean*	*Median*	***Standard Deviation***	***Range***
Panel A: DoS Attack Firms					
Total Sales	3	817.72	588.61	734.85	224.72 – 1,639.84
Total Assets	3	1635.1	1469.82	767.27	963.94 – 2,471.55
Panel B: Control Firms					
Total Sales	126	159.86	32.73	1098.06	0.36 – 12,154.00
Total Assets	126	430.43	130.82	1425.14	2.99 – 14,725.00
Panel C: Internet Security Provider Firms					
Total Sales	10	88.36	85	76.41	4.97 – 218.12
Total Assets	10	369.96	157.68	571.79	9.78 – 1,512.12

In Table 2 we present descriptive statistics for the DoS attack sample firms, control firms and internet security provider firms. The DoS attack firms have mean sales of $817.72 million and mean assets of $1,635.10 million. The DoS attack firms are significantly larger than the control firms and

the internet security provider firms at the 0.01 level. This is consistent with hackers choosing to attack the large internet firms. The control firms have larger sales than the internet service provider firms. However, they are similar in size according to assets. Additionally, the standard deviations for control firms reflect a wide range in firm size according to sales (1,098.06) and assets (1,425.14).

In Table 3 we present the DoS attack firms and control firms by industry. SIC code descriptions are obtained from the U. S. Department of Labor Occupational Safety & Health Administration website (www.osha.gov). Two of the attacked firms are in the catalog, mail order houses industry (Amazon and eBay). The third DoS attack firm is in the computer programming, data processing industry (Yahoo). The majority of internet firms (69.8%) in the control firm sample are in the business services industry.

Table 3: Firms by Industry

Attacked Firms		Control Firms	
Catalog, mail-order houses	2	Oil & Gas Extraction	2
Computer programming, data processing	1	Fabricated Metal Products Manufacturers	1
		Industrial & Commercial Machinery Manufacturers	2
		Electronic & Other Electrical Equipment Manufacturers	5
		Miscellaneous Manufacturing Industries	1
		Transportation Services	2
		Communications	4
		Wholesale Trade	3
		Miscellaneous Retail	8
		Depository Institutions	1
		Non-depository Institutions	1
		Security & Commodity Brokers	2
		Insurance Agents Brokers & Services	1
		Real Estate	1
		Business Services	88
		Amusement & Recreation Services	2
		Engineering, Accounting Management Services	1
Total	3	Total	126

METHODOLOGY

We use intraday data to examine investors' reaction to DoS attacks that completely prohibit internet firms from conducting business. We examine the market impact of DoS attacks by examining stock price returns. Returns are calculated as follows:

$$R_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}}$$

where $R_{i,t,}$ the return for the attack period, is calculated as the percentage change in stock price between $P_{i,t,}$ the average price of the first 15-minute interval after the start of the attack and $P_{i,t-1,}$ the average price of the last 15-minute interval of the attack period.

Portfolio Approach

We use a portfolio approach advocated by Campbell et al. (1993) to further test the impact of DoS attacks. The main advantages of the portfolio formation are that unique risk factors are diversified away and errors caused by the cross correlation of the error terms are mitigated. This approach estimates abnormal returns by comparing the return of the DoS sample firm to the average return of a portfolio of control firms for the same period. Our control sample consists of other internet firms traded on NASDAQ that were not attacked during the sample period. We choose these firms to overcome the intraday effects in stock returns (see Chan, Christie and Schultz (1995)). To further test the impact of DoS attacks, we also form a portfolio of internet security provider firms in order to compare their returns to those of the DoS attack firms.

We estimate abnormal returns for twenty 15-minute intervals before and twenty 15-minute intervals after the attack to assess the market's immediate reaction to the DoS attacks. The abnormal returns are calculated as the return for the DoS attack firm minus the average return for the control sample firms for the same period based on the following formula:

$$A_{i,t} = R_{i,t} - E(R_c)_{i,t}$$

where $A_{i,t}$ denotes the abnormal return for the i^{th} 15-minute interval of day t, $R_{i,t}$ is the sample return for the i^{th} 15-minute interval of day t and $E(R_c)$ is the expected return of the control portfolio of equally weighted internet firms not affected by the DoS attacks for the i^{th} 15-minute interval of day t. The equally weighted portfolio for control firms was utilized due to the size difference that could obscure the impact of the event in case of a value weighted approach. The cumulative abnormal returns during the event window are denoted as CAR_t, as shown below:

$$CAR_t = \sum_{t=-20}^{20} A_t$$

Trading Volumes

We also examine trading volumes surrounding the DoS attacks to further test investor response to DoS attacks. Cready and Hurtt (2002) provide evidence that volume based metrics are more powerful in detecting investor responses to public disclosures than returns based methodology. In the literature, the alternative approaches on defining and measuring market reaction consist of the use of returns or volume as a measure of market reaction. Lee (1992) finds that the market reacts quickly to new information both in adjusting returns and volumes.

To determine whether there is a significant change in trading volume immediately surrounding the DoS attacks, we examine the difference between the mean trading volume in the pre- and post-attack periods. This methodology is used because we are unable to obtain the total shares outstanding of control firms for the related intraday periods, which would be necessary to standardize trading volume. The pre-attack period consists of the twenty 15-minute intervals prior to the attack and the post-attack period consists of the twenty 15-minute intervals subsequent to the attack.

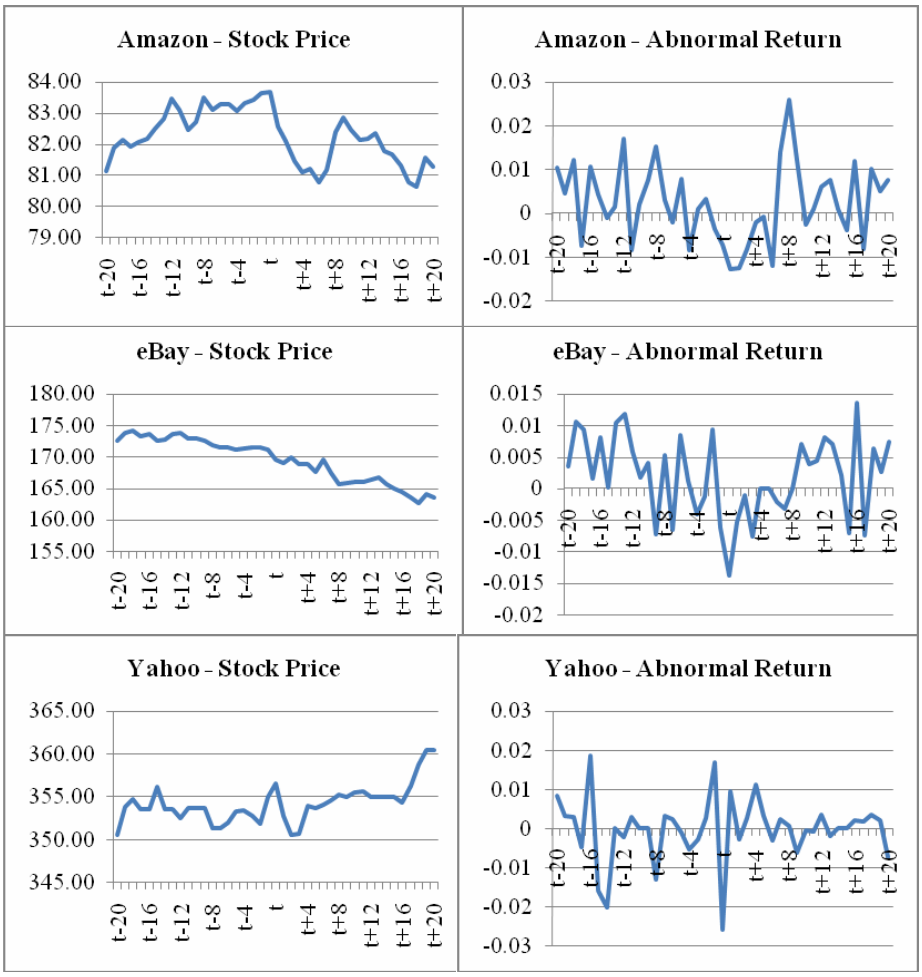
EMPIRICAL ANALYSIS AND RESULTS

We investigate the effects of DoS attacks on stock price and abnormal returns. Although our primary interest is the impact of abnormal returns around DoS attacks, we begin our analysis by investigating stock price reactions surrounding the attacks. Figure 1 shows the stock prices and abnormal returns for twenty 15-minute intervals before the attack to twenty 15-minute intervals after the attack for each sample firm. The stock price for Amazon and Yahoo reaches its peak in the period of the DoS attack ($83.69 and $356.56, respectively) and declines after the attack. Amazon's stock price declines for the following four 15-minutes intervals before it begins to increase. Yahoo's stock price declines for the following two 15-minute intervals before it begins to increase. While Yahoo's stock price recovers and surpasses the attack stock price at *t+18*, Amazon's stock never reaches the peak of its DoS stock price in the post-attack period. eBay's slow stock price decline in the pre-attack period becomes more steady in the post-attack period.

To test hypothesis 1, we examine the abnormal stock returns of the three DoS attack firms. The results are presented in Table 4. All three firms experienced negative returns related to the DoS attacks. Yahoo experienced the greatest stock price decline of 2.6% while Amazon experienced the smallest decline of 0.7%. The mean abnormal returns are significantly negative at the 0.01 level for all three DoS attack firms. These results also show that the negative abnormal returns due to a DoS

attack are in line with the duration and timing of the event. This is consistent with our hypothesis that the stock price of an internet firm will be negatively affected by a DoS attack.

Figure 1: Stock Prices and Abnormal Returns Surrounding Distributed Denial of Service Attacks



Amazon and eBay show negative abnormal returns surrounding the event. Amazon's abnormal returns are negative from the first 15-minute interval before the attack *t-1* until the sixth 15-minute interval after the attack *t+6* while eBay's abnormal returns are negative from the first 15-minute interval before the attack *t-1* until the third 15-minute interval after the attack *t+3*. Yahoo's abnormal return, however, is only negative at the point of the attack, *t*. In observing the twenty intervals before the attack to twenty periods after the attack, all three firms experienced their lowest abnormal return in the period immediately surrounding the DoS attack. These results suggest that

while the internet firms are affected by the DoS attack, they appear to rebound and continue as normal shortly after the attack.

Table 4: Abnormal Returns OF Denial of Service Attack			
	Amazon	*eBay*	*Yahoo*
Attack Period Abnormal Return(t0)	-0.007	-0.014	-0.026
Std Deviation	0.019	0.025	0.039
t-stat	-2.430***	-3.580***	-4.260***
*** represents significance at the 1% level.			

To test our second hypothesis that the stock price of an ISP firm will be positively affected by a DoS attack in the internet industry, we examine the differences between the mean returns for the ISP sample firms and the control sample firms during the time of the DoS attacks. Table 5 presents the mean returns for both samples along with the abnormal returns for the ISP firms.

Table 5: Abnormal Returns for Internet Service Providers				
	ISP Mean Return (%)	Control Sample Mean Return (%)	Difference	t-stat
Amazon	-0.166	-0.047	-0.119	-0.28
eBay	-0.105	-0.258	0.153	0.51
Yahoo	0.029	-0.179	0.208	1.15

Using intraday data for the event period, we find results similar to Ettredge and Richardson (2003) for the control sample firms. The mean returns for internet firms that were not attacked (control sample firms) are negative. This suggests that information about the attack is transferred to other firms that also conduct business on the internet. As we examine the differences between the ISP mean returns and the control sample mean returns, however, we find mixed results. The abnormal return is negative during the Amazon attack period and positive during the eBay and Yahoo attack periods. The negative ISP firm abnormal return during the Amazon attack period could be the result of this attack occurring after trading hours. Furthermore, we note that none of the abnormal returns are significant. This could be attributed to the brevity of the attacks and the resolution of the attacks during the same day. Overall, unlike Ettredge and Richardson (2003), we do not find that ISP firms experience positive abnormal returns when internet firms are attacked.
To further ascertain the information impact of DoS attacks, we examine another investor metric, trading volume. Table 6 presents the mean volume of trades surrounding the DoS attacks. The pre-attack period represents the twenty 15-minute intervals prior to the denial of service attack. The post-
attack period represents the twenty 15-minute intervals subsequent to the denial of service attack.

Table 6: Mean Volume of Trades Surrounding the Denial of Service Attacks			
	Amazon	*eBay*	*Yahoo*
Post-Attack Period	305138	64735	113627
Pre-Attack Period	530515	92239	102640
Difference	-225377	-27504	10987
t-stat	-2.56***	-1.41*	0.16
***, ** and * represent significance at 1%, 5% and 10% levels, respectively.			

The results support our hypothesis that trading volume will decrease during the attack period. There is a significant decrease in the volume of trades for Amazon and eBay at the 1% and 10% levels, respectively. Amazon's volume of trades decreased 225,377 and eBay's decreased 27,504. While Yahoo's volume increases by 10,987 trades, the increase is insignificant. This increase in the Yahoo volume of trades could result from its DoS attack being resolved before the end of trading on that day. Overall, our results provide evidence that investors did not purchase significant shares of stock during the DoS attacks.

CONCLUSION

This paper investigates the market impact of distributed denial of service (DoS) attacks on internet firms and the information transfer affecting the market value of other internet and internet security firms. This study is unique in that we use intraday data obtained from the NASTRAQ database to examine the market impact of the DoS attacks. Our study suggests that the market reacts negatively to firms experiencing DoS attacks. We report negative abnormal returns during the DoS attack and a decline in stock price immediately following the DoS attack. Additionally, we report negative returns for a control sample of internet firms that were not attacked. As such, it appears that information transfer exists among internet firms. In contrast, we further report that Internet Security Provider firms do not experience positive stock price affects from the DoS attacks. We also used volume of trades as an investor metric to measure the impact of DoS attacks. Our findings provide evidence that the volume of trades decreases during the attack period. The implications of this study demonstrate that firms that operate online can experience negative market effects from DoS attacks, such as loss of sales, drop in stock price and market capitalization unlike traditional retail stores.

This study can be extended by segregating DoS attacks by nature of the attack (severity and ability to return network to normal operations differ) to determine whether the market reacts differently depending on the nature of the attack. There are also implications for the long-term consequences and the cost of security to address these DoS attacks. A second extension could segregate the firms attacked by size (i.e., market capitalization, revenue and internet traffic), since

conceivably the impact of a DoS attack could be greater for firms with higher internet traffic resulting in higher revenue losses.

This study has two limitations that should be taken into account when considering its contributions. First, our study consists of a small sample size. In order to compare the immediate market reaction to the same DoS attacks investigated by Ettredge and Richardson (2003), our sample only consists of three firms. Second, one of the DoS attacks occurred after trading hours while two of the attacks ended after trading hours. Accordingly, we have taken steps in this study to mitigate the effects of these limitations.

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MARGIN DEBT BALANCE VS. STOCK MARKET MOVEMENTS AND EXPECTED GDP GROWTH

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ABSTRACT

Changes in margin debt balance at both the New York Stock Exchange and the NASDAQ stock market follow the movements of major stock indexes and expected GDP growth. This indicates that margin debt borrowers increase positions in their margin accounts after they see stock prices and expected GDP growth rise and reduce their positions after they observe stock prices and expected GDP growth decline. Margin debt balance at the NYSE increases when interest rate rises and decreases when interest rate falls, which reveals that cost of margin debt does not weaken margin debt borrowers' focus on following stock market trends.

INTRODUCTION

Changes in the amount of margin debt may reflect certain investors' behavior and may well be related to stock market movements, which should provide investors and regulators with useful information. Initial margin requirements are set by the Federal Reserve, maintenance margin requirement is determined by individual brokerage firms.

The relationship between margin borrowing and stock returns is a key issue in the literature. The "pyramid" theory as described in Bogen and Krooss (1960) argues that margin debt increases stock market volatility. In periods of rising stock markets, investors borrow more margin loans and buy more stocks in their margin accounts, inducing higher stock prices and subsequently qualifying the borrowers for additional margin loans. Reversely, when the stock markets are declining, the margin loan borrowers are forced to sell stocks following margin calls, inducing further decreases in stock prices and more subsequent sales. Yet, it is not clear whether margin debt is a cause of the stock returns or just an indicator of the market (Fortune, 2001). Domian et al. (2006) and Zhang (2005) show evidence that margin debt responds to previous stock returns rather than vice versa.

Most margin debt borrowers are believed to be individual investors or noise traders (Kofman & Moser, 2001). Past research works report an unclear causal relationship between individual investors' sentiment and stock market price (see Gervais & Odean, 2001; Brown & Cliff, 2004; Wang et al., 2006; Fisher & Statman, 2000; Baker & Wurgler, 2006). Changes in margin debt may signal investor sentiment.

Interest rates on margin debt represent the cost for margin debt. Brokerage firms set their margin debt interest rates based on call rate, which is in turn based on the prime rate. Domian and Racine (2006) find that margin borrowing is negatively related to short term interest rate. However, margin debt borrowers may not consider this cost when they borrow because they expect significant return from buying stocks and want to use the leverage.

Economic growth is a closely watched indicator by investors because economic growth is closely positively related to stock market returns, yet the timing is uncertain. Investors buy more stocks when they expect higher economic growth and sell when they expect economic declines.

In this study we further research the relationship between margin debt and stock returns. We use both regression and Granger causality tests to examine whether stock market movements lead margin debt changes, or vice versa. We also examine whether the level of interest rate on margin debt affects margin loan borrowing. Finally, we try to find whether margin loan borrowers' behavior is affected by expected macro economic growth.

The paper is organized as follows. Section 2 describes the data. Section 3 presents the empirical results, and Section 4 concludes.

DATA

Data of outstanding margin debt balances are obtained from the New York Stock Exchange (NYSE) and the NASDAQ, respectively. Only monthly data of margin debt balances are available. Data of the prime rate and GDP growth rate are from International Financial Statistics that is published by the International Monetary Fund. Since only quarterly GDP growth data is available, we convert the quarterly data into monthly data by calculating the geometric monthly average. The S&P 500, the New York Stock Exchange Composite. Russell 2000, DJIA (the Dow Jones Industrial Average), NASDAQ Composite, and NASDAQ 100 indexes are from finance.yahoo.com. The sample period is from January 1997 to September 2008 for NYSE and January 1997 to June 2007 for NASDAQ due to margin debt data availability. Summary statistics are reported in Table 1.

Following Domian and Racine (2006), we calculate the percentage changes in margin debt balances and prime rate. Most economic models imply that interest rates are stationary (Ang & Bekaert, 2001). We use the growth rate of output as did Fama and French (1989), Chen (1991), and Marathe and Shawky (1994). Consistent with prior findings, our test show that the growth rate of output for the sample time period is stationary, or that the output is a difference stationary series. Results of Dickey-Fuller tests and Augmented Dickey-Fuller tests are in Table 2 and 3, respectively. The tests support the stationary of each series in our sample.

Table 1. Summary Statistics Jan 1997 – Sept 2008*					
Variable	N	Mean	Std Dev	Minimum	Maximum
Margin Debt at the NYSE	140	198662.13	66463.68	98870	381370
Percent change in the margin debt	140	0.0079	0.0453	-0.1405	0.1237
Margin Debt at the NSDQ	125	13863.94	7303.95	3886	30204
Percent change in the margin debt	125	0.0164	0.1872	-0.4834	0.9881
S&P500 Close	140	1192.57	191.7196	757.12	1549.38
Return of S&P500	140	0.0028	0.0440	-0.1576	0.0923
NYA	140	6837.31	1425.88	4214.16	10311.61
Return of NYA	140	0.0039	0.0410	-0.1623	0.0888
Russell 2000 Close	140	549.0835	139.5646	337.95	847.18
Return of Russell 2000	140	0.0044	0.0569	-0.2168	0.152
DJIA Close	140	10241.73	1573.27	6583.48	13930.01
Return of DJIA	140	0.0033	0.0443	-0.1641	0.1008
NSDQ100 Close	125	1715.75	760.2205	797.06	4397.84
Return of NSDQ100	125	0.0059	0.0925	-0.3066	0.2230
NSDQ Composite Close	125	2157.53	699.4113	1172.06	4696.69
Return of NSDQ Composite	125	0.0051	0.0823	-0.2601	0.1987
GDP	140	11043.72	1872.55	8111.64	14422.9
GDP growth rate	140	0.0041	0.0020	-0.0011	0.0093
Prime rate	140	6.7935	1.8102	4	9.5
Percent change in prime rate	140	-0.0036	0.0314	-0.1335	0.0645
Return of DJIA *Data of NASDAQ margin debt and NASDAQ stock returns are from Jan 1997 to Jun 2007 due to data availability.					

Table 2. Dickey-Fuller Unit Root Tests					
Variable	Type	Rho	Prob<Rho	Tau	Prob<Tau
Percent change of margin debt at the NYSE	No mean	-102.04	0.0001	-6.90	<0.0001
	mean	-103.848	0.0001	-6.91	<0.0001
	trend	-107.686	0.0001	-7.06	<0.0001
Return of S&P500	No mean	-131.153	0.0001	-8.03	<0.0001
	mean	-131.425	0.0001	-8.01	<0.0001
	trend	-142.637	0.0001	-8.36	<0.0001
Return of NYA	No mean	-129.452	0.0001	-7.98	<0.0001
	mean	-130.252	0.0001	-7.98	<0.0001
	trend	-138.708	0.0001	-8.24	<0.0001
Return of Russell 2000	No mean	-137.953	0.0001	-8.24	<0.0001
	mean	-138.628	0.0001	-8.23	<0.0001
	trend	-141.565	0.0001	-8.31	<0.0001
Return of DJIA30	No mean	-156.39	0.0001	-8.78	<0.0001
	mean	-157.37	0.0001	-8.77	<0.0001
	trend	-167.3	0.0001	-9.05	<0.0001
Percent change of margin debt at NASDAQ	No mean	-218.339	0.0001	-10.37	<0.0001
	mean	-223.235	0.0001	-10.44	<0.0001
	trend	-223.401	0.0001	-10.39	<0.0001
Return of NASDAQ 100	No mean	-123.024	0.0001	-7.82	<0.0001
	mean	-124.755	0.0001	-7.85	<0.0001
	trend	-126.349	0.0001	-7.88	<0.0001
Return of NASDAQ Composite	No mean	-120.628	0.0001	-7.74	<0.0001
	mean	-122.168	0.0001	-7.77	<0.0001
	trend	-122.758	0.0001	-7.76	<0.0001
Percent change of prime rate	No mean	-246.16	0.0001	-10.56	<0.0001
	mean	-247.908	0.0001	-10.58	<0.0001
	trend	-251.515	0.0001	-10.64	<0.0001

Table 3. Augmented Dickey-Fuller Unit Root Tests*		
Variable	Type	t-stat
GDP growth rate	No mean	-1.46
	mean	-3.27**
	trend	-3.31**
*Dicky-Fuller critical values are -3.5, -2.9, and -2.59 for significance level of 1%, 5%, and 10%, respectively. **significant at 5%		

METHODS AND RESULTS

First, we run regressions using the basic model:

$$MD_t = \beta_0 + \beta_1 IR_{it} + \beta_2 PR_t + \beta_3 GR_t \quad (1)$$

Where,

MD = percentage change in margin debt
IR = index return
PR = percentage change in prime rate
GR = GDP growth rate
i = stock index: S&P 500, NYA, R2000, DJIA, NASD 100 and NASD Composite

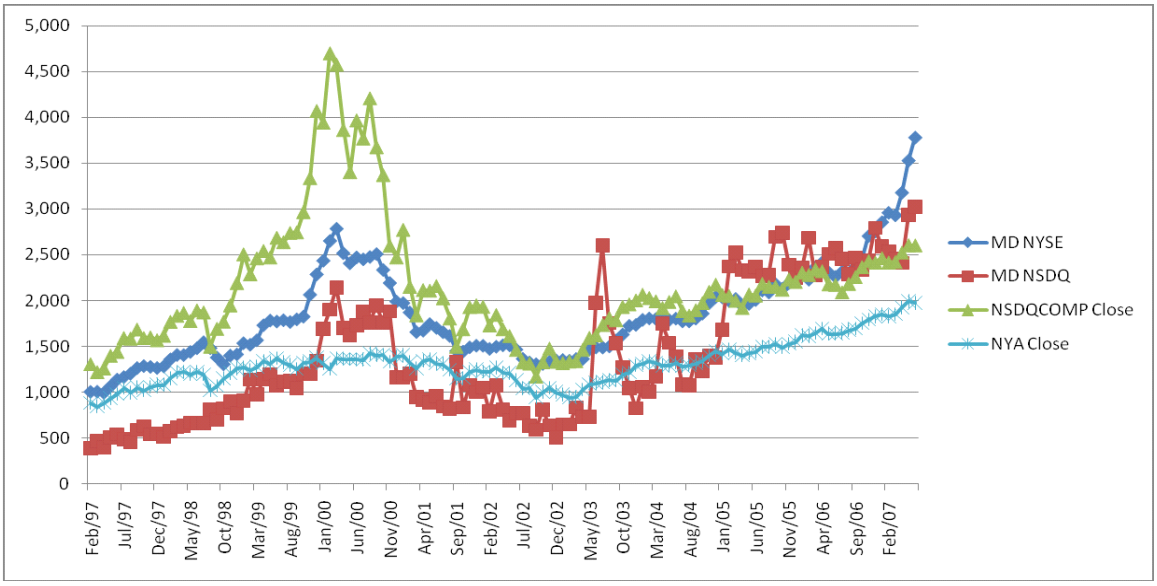
We present the regression results in Table 4. Panel a and b show the results using the NYSE and NASDAQ margin debt as the dependent variable, respectively. The independent variables for index returns include the S&P 500 index, the NYA, the Russell 2000 and the DJI. All the variables are for t = 0.

The regression results show significantly positive relationship between percentage change in margin debt at the NYSE and changes in all the stock indexes. For example, a 10 percent increase in the S&P 500 index is related to a 4.6 percent increase in margin debt at the NYSE. A 10 percent increase in NYA, Russell 2000 and DJIA are related to 2.2 percent, 4 percent and 3.7 percent increase in margin debt at the NYSE, respectively. The evidence indicates that margin debt borrowers borrow more and buy more stocks in their margin accounts as stock markets rise, and sell stocks in their margin accounts to reduce their margin debt when stock markets decline. Some of them are forced to sell their stocks after margin calls. However, changes in margin debt at the NASDAQ stock market are significantly related only to returns of the NYA, and the relationship is negative. Further research is needed to explain this phenomenon.

Figure 1 shows a clear pattern that margin debt moves in the same direction with the stock market. This pattern is very prominent in the strongest bullish market trend from September 1998

to March 2000 when both the stock market and margin debt increased significantly; and in the biggest bearish market trend from March 2000 to October 2002 when both the stock market and margin debt declined sharply. Also, margin debt at the NASDAQ stock market is much more volatile than margin debt at the NYSE as shown in Table 1 and Figure 1.

Figure 1. Margin Debt at the NYSE and NASDAQ versus NASDAQ Composite and NYA Close



The regressions show statistically significant positive relationship between percentage change in margin debt at the NYSE and percentage change in prime rate. This indicates that margin debt borrowers' borrowing decision is not affected by the cost of borrowing. They borrow more and buy more stocks even as the interest rate rises and borrow less as the interest rate declines. Or, stock return is the dominate factor for their borrowing decisions, they increase their borrowings in bullish periods and reduce their borrowings in bearish periods. Here we use percentage change in prime rate as an approximation for percentage change in margin debt interest rate which measures the cost for borrowing margin debt.

Margin debt interest rates are different among brokerage houses who charge some percentage points above the call rate, which is based on the prime rate. It is well known that interest rates are positively related to long-term stock market growth, generally, the prime rate and call rate is low during recession time and high when the economy is booming. It is also well known that stock prices decrease before and in recession time and increase before and when the economy is booming, and stock markets move ahead of the economy by inconstant number of months.

The regression analyses reveal some weak positive relationship between percentage change in margin debt at the NASDAQ stock market and macro economic growth measured by GDP growth rate. This may indicate that margin debt borrowers borrow more and buy more stocks in their margin accounts when the economy grows. However, the relationship is significant only in the regression using returns of NYA.

The relationship between percentage changes in margin debt at the NASDAQ and current month NASDAQ indexes' returns, the percentage change in prime rate, and GDP growth rate is not significant. Further research is required in order to find the explanation.

In order to identify possible lead-lag relationship between percentage change in margin debt and the independent variables we conduct regressions with different time lead and lag, i.e., we estimate the model for all combinations of lead lag lengths t = -3, -2, -1, 1, 2, 3. The optimal results are presented in Table 4, panel c and d.

$$MD_t = \beta_0 + \beta_1 IR_{i,\,t-1} + \beta_2 PR_t + \beta_3 GR_{t+3} \qquad (2)$$

Regressions using Equation (2) provide improved results compared to Equation (1), as measured by the adjusted R-squared. As shown in Table 4, panel d, returns of the NASDAQ indexes in the previous month have a significant positive impact on margin borrowing at the NASDAQ stock market in the current month. This reveals that margin debt borrowers respond to market trends, or they buy more in their margin accounts after they observe stock prices rise, and sell stocks in their margin accounts, repay their margin debts after they see stock prices fall.

The regression results of Equation (2) also reveal that expected output growth has a statistically significant positive relationship with percentage change in margin debt at the NYSE. As shown in Table 4, panel c, coefficients for the independent variable GDP growth rate t+3 are statistically significant in all regressions except for the one with returns of Russell 2000. This indicates that margin borrowers buy more stocks on margin when they expect output growth increase in the next quarter and sell their margin account stocks when they expect output growth decline in the next quarter. Assuming rational expectation, we use the reported GDP growth rate of the following quarter as an approximation for the expected output growth rate because there is no reliable and consistent data for expected GDP growth. However, the relationship is not significant for margin debt at the NASDAQ stock market.

Table 4, a. Margin Debt at the NYSE versus Stock Return, Prime Rate, and Growth Rate (t = 0)								
	(1) SP500		(2) NYA		(3) R2000		(4) DJIA	
	Coef	Std error	Coef	Std error	Coef	Std error	Coef	Std error
Constant	0.0070	(0.0103)	0.0028	(0.0109)	0.0040	(0.0099)	0.0048	(0.0105)
Stock Return$_t$	0.4613 ***	(0.0973)	0.2159*	(0.1126)	0.4004***	(0.0706)	0.3715***	(0.0990)
Prime Rate$_t$	0.3036 **	(0.1331)	0.2639*	(0.1419)	0.3081**	(0.1290)	0.3148**	(0.1376)
Growth Rate$_t$	0.2203	(2.2144)	1.3362	(2.3647)	0.8336	(2.1233)	0.8026	(2.2684)
Observation	140		140		140		140	
Adj R-squared	0.1609		0.0419		0.2111		0.1116	
*significant at 10% level **significant at 5% level *** significant at 1% level								

Table 4, b. Margin Debt at the NASDAQ versus Stock Return, Prime Rate, and Growth Rate (t = 0) (Jan 1997 – Jun 2007)						
	(1)NSDQ 100		(2)NSDQ composite		(3)NYA	
	Coef	Std error	Coef	Std error	Coef	Std error
Constant	-0.0473	(0.0538)	-0.0466	(0.0536)	-0.0607	(0.0521)
Stock Return$_t$	0.0578	(0.2402)	0.1328	(0.2678)	-1.0314*	(0.5439)
Prime Rate$_t$	-0.3704	(0.7836)	-0.3448	(0.7837)	-0.5333	(0.7589)
Growth Rate$_t$	14.6999	(11.5524)	14.4451	(11.4980)	19.5096*	(11.1724)
Observation	125		125		125	
Adj R-squared	-0.0098		-0.0081		0.0214	
*significant at 10% level						

Table 4, c. Margin Debt at the NYSE versus Stock Return, Prime Rate, and Growth Rate								
	(1) SP500		(2) NYA		(3) R2000		(4) DJIA	
	Coef	Std error	Coef	Std error	Coef	Std error	Coef	Std error
Constant	-0.0098	(0.0101)	-0.0132	(0.0107)	-0.0062	(0.0099)	-0.0131	(0.0103)
Stock Return$_t$	0.4416***	(0.0949)	0.2134*	(0.1091)	0.3838***	(0.0708)	0.3681***	(0.0960)
Prime Rate$_t$	0.2302*	(0.1326)	0.1923	(0.1409)	0.2605**	(0.1298)	0.2360*	(0.1361)
Growth Rate$_{t+3}$	4.2226*	(2.1956)	5.1593**	(2.3259)	3.2912	(2.1626)	5.0717 **	(2.2343)
Observation	140		140		140		140	
Adj R-squared	0.1842		0.0748		0.2240		0.1448	
*significant at 10% level **significant at 5% level *** significant at 1% level								

Table 4, d. Margin Debt at the NASDAQ versus Stock Return, Prime Rate, and Growth Rate
(Jan 1997 – Jun 2007)

	(1)NSDQ 100		(2)NSDQ composite	
	Coef	Std error	Coef	Std error
Constant	-0.0389	(0.0530)	-0.0419	(0.0528)
Stock Return$_{t-1}$	0.4420*	(0.2354)	0.4912*	(0.2629)
Prime Rate$_t$	-0.4503	(0.7677)	-0.4315	(0.7674)
Growth Rate$_t$	12.0932	(11.3745)	12.8187	(11.3288)
Observation	125		125	
Adj R-squared	0.0200		0.0197	
*significant at 10% level				

In order to confirm the lead – lag relationship between the variables discussed above, or whether stock market and expected output growth lead margin debt, we conduct Granger causality tests (for more discussion about Granger-causality, see Hamilton, 1994, or Enders, 1995). Granger (1969) proposed a test to determine whether or not a series x_t "causes" changes in the series y_t. A critical implication of Granger causality tests is that they do not prove causality in the general sense; rather they illustrate Granger-causality, i.e., they reveal whether or not current and/or lagged values in the series x_t improve our ability to forecast changes in y_t. The standard bi-variate Granger causality test is based on OLS regressions of the following two equations:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + \ldots + \alpha_p y_{t-p} + \beta_1 x_{t-1} + \beta_2 x_{t-2} + \ldots + \beta_p x_{t-p} + \mu_t \quad (3)$$

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \alpha_2 x_{t-2} + \ldots + \alpha_p x_{t-p} + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \ldots + \beta_p y_{t-p} + \mu_t \quad (4)$$

The test for whether or not *x* Granger causes y is based on the results of an F-test on the joint hypothesis:

$$H_0: \beta_1 = \beta_2 = \ldots = \beta_p = 0.$$

If the null hypothesis is rejected for equation (3), we conclude that x Granger-causes y. The same test also applies to equation (4) to check whether *y* Granger-causes x. From the above regressions there are four potential outcomes: x Granger-causes y, y Granger-causes x, causality runs in both directions, and causality runs in neither direction. Perhaps the most useful results would be where causality runs in only one direction, which implies that, for example, by knowing past values of x, we can improve the forecasts of y.

We use lag p = 1 for index returns and lag p = 3 for GDP growth to see whether results from the Granger-causality tests confirm the results of regressions on Equation (2).

Results of the Granger-causality tests are reported in Table 5. The null hypothesis that the stock index returns do not Granger-cause margin debt is rejected in 7 out of 10 tests. This indicates that returns of S&P 500 Index, NYA, Russell 2000 and DJIA Granger-cause changes in margin debt balance at the NYSE; and returns of NASDAQ Composite Index, NASDAQ 100, and Russell 2000 Granger-cause changes in margin debt balance at the NASDAQ stock market. For each of the pairings the direction of Granger-causality runs in only one direction. These results confirm the results from regression equation (2) and further indicate that margin debt borrowers follow market trends, i.e., they buy more stocks in their margin accounts after they see stock prices rise, and sell stocks in their margin accounts to pay back the margin debts after they observe stock prices decline. The null hypothesis that margin debt does not Granger-cause stock return cannot be rejected in any of the regressions, which indicates that margin debt borrowers' behavior does not lead stock market trends.

The Granger-causality tests also reveal that expected output growth leads changes in margin debt borrowing during the sample period. As shown in Table 5 panel b, the null hypothesis that expected output growth does not Granger-cause changes in margin debt is rejected. The causation is statistically significant for margin debt balances at both the NYSE and the NASDAQ stock market. For each of the pairings the direction of Granger-causality runs in only one direction. The tests confirm the results from regression equation (2) and further indicate that expected output growth has a significant impact on margin debt borrowers behavior, i.e., they increase their positions in their margin account when expected GDP growth increases, and reduce their margin account positions when expected GDP growth declines.

Table 5, a. Granger Causality Tests, Margin debt versus Stock returns, F-Statistics.*

Margin Debt	Stock Return	Stock return does not Granger cause margin debt	Margin debt does not Granger cause stock return
Margin debt at NYSE	S&P 500	10.3070*** (0.0000676)	0.0002 (0.9998)
Margin debt at NYSE	NYA	8.0182*** (0.0005123)	0.0160 (0.9841)
Margin debt at NYSE	Russell2000	9.2437*** (0.0001728)	0.0939 (0.9104)
Margin debt at NYSE	DJIA	5.7754*** (0.00392)	0.0138 (0.9863)
Margin debt at NASDAQ	Nasdaq Composite	2.9468* (0.05632)	0.2052 (0.8148)
Margin debt at NASDAQ	Nasdaq 100	2.6036* (0.0782)	0.4197 (0.6582)
Margin debt at NASDAQ	S&P 500	0.8215737 0.442157	0.0204 (0.9797)
Margin debt at NASDAQ	NYA	0.6774133 0.5098607	0.0034 (0.9966)
Margin debt at NASDAQ	Russell2000	2.4615* (0.0896)	0.1503 (0.8605)
Margin debt at NASDAQ	DJIA	0.2771 (0.7584)	0.0261 (0.9742)

*p-value in parentheses **significant at 5% level *** significant at 1% level

Table 5, b. Granger Causality Tests, Margin debt versus Growth rate, F-Statistics.*		
Margin Debt	Growth rate does not Granger cause margin debt	Margin debt does not Granger cause growth rate
Margin debt at NYSE	6.6864*** (0.001703)	0.6156 (0.5418)
Margin debt at NASDAQ	3.9564** (0.0217)	1.3669 (0.2588)
*p-value in parentheses **significant at 5% level *** significant at 1% level		

CONCLUSION

In this study we find that margin debt balances at both the New York Stock Exchange and the NASDAQ stock market increase as major stock indexes rise and decrease as the indexes decline. This indicates that margin debt borrowers follow stock market trends, i.e., they borrow margin debt and buy more stocks after they see stock prices rise, and sell stocks to repay their margin loans after they observe stock prices fall. However, margin debt borrowers' trading activities do not lead market trends.

Margin debt borrowers may not consider the cost of margin debt when they make their investment/borrowing decisions. Changes in margin debt balance at the NASDAQ stock market do not have statistically significant relationship with the interest rate. Margin debt balance at the NYSE increases when interest rate rises and decreases when interest rate declines, which reveals that cost of margin debt does not weaken margin debt borrowers' focus on following stock market trends.

Expected GDP growth also has a significant impact on margin debt borrowers' behavior. They borrow more margin debt as expected GDP growth rises, and reduce their borrowing as expected GDP growth falls.

Further research is required to find the difference between the behaviors of individual investors who prefer the companies listed on the NYSE and those who prefer the companies listed on the NASDQ stock market. It is also interesting to find if individual investors learn from experience and make improvements over time, i.e., whether they can buy into trends more quickly and reduce margin calls on them.

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UNDERSTANDING THE RELATIONSHIP OF DOMESTIC AND INTERNATIONAL FACTORS WITH STOCK PRICES IN INDIA: AN APPLICATION OF ARCH

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ABSTRACT

The present study attempts to identify the determinants of stock price level in India, an emerging market in the world. A multiple regression model is formulated for that purpose taking care of the time series properties of the variables. SENSEX, the country's most widely referred stock price index, is considered as the dependent variable. The explanatory variables include domestic and international factors, viz., index of industrial production (IIP), rate of interest (ROI), rate of inflation (INFN) and foreign institutional investment (FII). The model is tested for volatility clustering and test results indicate presence of ARCH (Auto Regressive Conditional Heteroskedasticity) effect. Instead of OLS (Ordinary Least Squares), therefore, the model is estimated by ML-ARCH method. Empirical findings show, however, that SENSEX is guided mainly by foreign institutional investment. The vulnerability of the stock market to foreign institutional investment is a cause for concern as it makes the market volatile and undermines investors' faith in stocks.

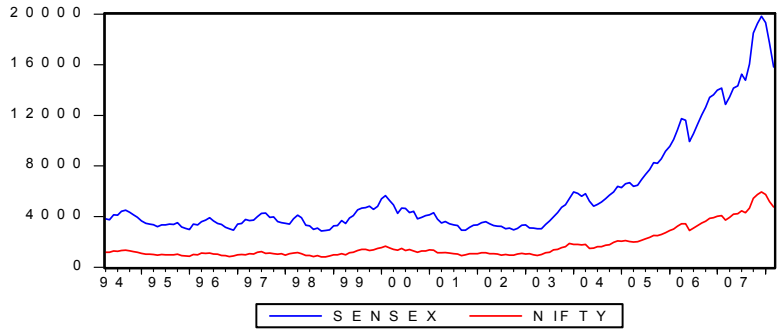
INTRODUCTION

Movements of SENSEX and other stock price indices in India since liberalization are wonder watching. SENSEX was below 1000 in 1990 and rose to the level of 3000 by 1992. The upward journey continued and eventually the index touched the historical level of 21000 in January, 2008. Thereafter, however, the bearish phase set in and brought down the index to the level of 8000 in the same year by the month of October. Similar trend was observed in NIFTY as well (Figure 1), the other most widely referred share price index in the country.

The surge in the stock market and its sudden downturn or, in general, the movement of the stock price level seems to be caused by two groups of factors – domestic and international. The domestic factors include GDP (Gross Domestic Product), index of industrial production, rate of interest, rate of inflation and other macro variables while international factors include international trade position, flows of foreign capital and foreign exchange rate. One may argue on the relative strength of those two groups of factors in influencing stock prices. In fact, there is a marked disagreement in the literature on this issue. Some argue that stock market is guided by international

factors while according to others, stock market movement reflects fundamentals of the economy. This study investigates how far the Indian stock market is dependent on the performance of its internal economy and how far it is affected by external factors.

Figure 1 : SENSEX and NIFTY



Source : RBI (Reserve Bank of India) Handbook of Statistics on Indian Economy

The present study builds an alternative model to examine the determinants of the stock price level. The study considers the case of India, an emerging stock market in the world. The study differs from the earlier ones in at least three respects. First, unlike earlier attempts the present study does not emphasize the direction of causality. Instead, it attempts to identify the key factors that considerably affect the stock price level in the country. Second, the study remains cautious in choosing the explanatory variables. In earlier studies, however, investigators picked up the macroeconomic variables on mostly ad hoc basis and applied econometric techniques to find out whether they cause and/or are caused by the stock price indices. The present study, on the other hand, considers only those variables which are most likely to influence stock prices. In choice of variables the study has relied upon the standard economic principles. Third, the study distinguishes between domestic and international factors and investigates whether the stock market is guided mainly by domestic factors or international factors or by both. International factors like flows of foreign capital and especially the foreign institutional investment is now widely admitted as the most formidable factor for stock markets around the world. Except a few, however, none of the earlier studies recognized the role of FII on the Indian stock market. The insignificant role of FII as it is revealed in the study of Ray and Vani (2006), is also not less surprising. In what follows, the role of FII has been reexamined in the present study.

The rest of the paper is divided into four sections. Section II makes a survey of the empirical literature. Section III identifies the factors affecting stock price level in the country and describes the methodology of the study. Empirical findings are shown in section IV and finally, the study is concluded in section V.

SURVEY OF THE LITERATURE

The impact of macroeconomic variables on asset prices has been subjected to extensive research. Early US studies of Bodie (1976), Fama and Schwert (1977), Jaffe and Mandelker (1977), Linter (1973), Nelson (1976), and Oudet (1973), which examined whether the financial assets were hedges against inflation, all reported a negative relation between stock returns and changes in the general price level. Fama (1981) produced documented evidence of a strong positive relationship between equity returns and real economic activities such as industrial production, capital expenditure and gross national product. Chen et al. (1986) who built on Fama's investigation, tested whether a set of macroeconomic variables would explain unexpected changes in equity returns. They documented evidence that the economic variables such as industrial production, changes in the risk premium and twists in the yield curve were significant in explaining stock returns. Pearce and Roley (1985) found that unexpected announcements in monetary policy had a significant influence on stock prices, while Jain (1988) also noted that announcements about money supply and the consumer price index were significantly associated with stock price changes.

Similar investigations were made on European markets. Errunza et al. (1998) investigated the impact of macroeconomic factors on monthly stock returns for eight countries viz., Italy, U.K., France, Germany, Switzerland, Netherlands, Belgium and USA. Monetary instability was found to be significant for Germany and France, whereas industrial production was a significant factor for Italy and Netherlands. In the case of U.K., Switzerland and Belgium, the importance of macroeconomic factors did not improve their ability to forecast. Tsoukalas, D. et al. (1999) investigated the determinants of stock prices in U.K. with the application of Vector Autoregression (VAR) technique and found that dividend price ratio affected stock returns.

Enough research has been made on emerging economies. Ibrahim, M.H. (1999), for instance, found that Malayasian stock market was informationally efficient in the short run but was not so in the long run. Kwon, C. S. et al. (1999) found that stock price indices were not a leading indicator for economic variables in Korea. After testing Vector Error Correction Model (VECM) on Singapore stock index, Mayasami and Koh (2000) found that the market was interest and exchange rate sensitive. Tsoukalas (2003) examined relationship between stock prices in Cyprus and macroeconomic factors by using VAR model. They found that equity market in Cyprus was sensitive to variations in the exchange rate and industrial production.

While many studies have been conducted in this area abroad, only a few have so far been undertaken on Indian economy. Studies by Pethe and Karnik (2000), Bhattacharya and Mukherjee (2002), Ray and Vani (2006), Sharma and Singh (2007), Ahmed (2008), Chakrabarti (2001), Rai and Bhanumurthy (2004) are noteworthy in this context. The studies differ in choice of variables, methodology and time span. Pethe and Karnik used cointegration and error correction model to test for causality between macro variables and the two major share price indices in India, viz., SENSEX and NIFTY using monthly data for the period extending from April 1992 to December 1997. Five macroeconomic variables were considered for the investigation, viz., exchange rate of rupee against

dollar, prime lending rate, narrow money supply (M1), broad money supply (M3) and index of industrial production. Results showed that only index of industrial production affects SENSEX and NIFTY but not the converse. The study, however, found no evidence of causality between other macro variables and the stock price indices.

Bhattacharya and Mukherjee (2002) used Toda and Yamamoto's long run Granger causality test to examine the causal relationships between SENSEX and five macroeconomic variables, viz., money supply, index of industrial production, national income, interest rate and rate of inflation using monthly data for the from 1992-93 to 2000-01. They found that index of industrial production causes SENSEX while there exists a bi-directional causality between SENSEX and rate of inflation. Ray and Vani (2006) applied non-linear technique like VAR and Artificial Neural Network (ANN) to examine causal linkage between the economic variables, viz., index of industrial production, interest rate, inflation, exchange rate, money supply, fiscal deficit and foreign institutional investment and the stock market index SENSEX. Monthly data for the period from 1994 to 2003 were considered for empirical investigation. Exchange rate, index of industrial production, money supply, interest rate and inflation rate came out as the most influencing variables to the Indian stock market.

Sharma and Singh(2007)'s work was based on monthly data of comparatively long horizon covering the period from April 1986 to March 2005. They applied multiple regression analysis to test for the significance of the variables, viz., foreign exchange reserves, claims on private sector, wholesale price index, call money rate, index of industrial production, exchange rate and broad money on SENSEX. Variables like foreign exchange reserves, exchange rate, index of industrial production, money supply (M3) and claims on private sector were found to have considerable influence on the stock market movement. However, a few variables like interest rate and wholesale price index showed very negligible influence on the stock market.

In a more recent work covering the period from March,1995 to March, 2007 and using quarterly data Ahmed (2008) studied causal relation between index of industrial production, exports, foreign direct investment, money supply, exchange rate, interest rate, NIFTY and SENSEX. Toda and Yamamoto's Granger causality test was applied to explore the long run relationships between the variables while BVAR modeling for variance decomposition and impulse response functions were applied to examine short run relationships. The results of the study revealed differential causal links between aggregate macroeconomic variables and stock indices in the long run. However, the revealed causal pattern was similar in both markets in the short run. The study indicated that stock prices in India lead exchange rate, exports, index of industrial production, money supply while interest rate and foreign direct investment lead stock prices.

In a number of studies, researchers tried to find out the determinants of FII flows into India and also the impact of such flows on the stock market of the country. The studies obtained contradictory results. Chakrabarti(2001), for instance, investigated the causal relationship between FII and stock market returns. The study marked a regime shift in the determinants of FII after Asian crisis. The study found that in the pre-Asian crisis period any change in FII had a positive effect on

the equity returns. But in the post-Asian crisis period the causation was reverse – equity returns rather caused FII. In another study, Rai and Bhanumurthy (2004) also found that FII flows depend, among others, on stock market returns. However, the study did not find any causation running from FII inflows to stock returns.

FACTORS AND METHODOLOGY

The present study makes an investigation into the determining factors of the stock price level. The study sorts out the potential explanatory variables and formulates a suitable model to test for the significance of those variables in explaining stock price movement. This section contains two sub sections. Sub section IIIA discusses the factors affecting stock price level and sub section IIIB explains the methodology.

Factors

Factors affecting stock price level may be divided into two categories. On the one hand, there are domestic macro variables like GDP, interest rate or inflation. On the other hand, stock market is influenced by international factors and especially by foreign investment. The present study considers both domestic and international factors.

Domestic Factors

The stock market reflects the performance of an economy. When the economy does well and the companies make lucrative profit people get induced to invest in stocks because they expect high dividend income from their stockholding. The dismal performance of the economy, for the same reason, fails to attract investors to the stock market. The performance of an economy is best judged by the value of its GDP (Gross Domestic Product). Stock price indices are therefore likely to move with GDP. The high growth rate of GDP in recent years (Table 1) makes this conjecture sensible. However, one may find it more meaningful to correlate stock market behavior to the performance of the industrial sector rather than the entire economy. The economy includes other sectors as well. It includes, for instance, agriculture which has only an indirect relation with the stock market of the country. The public limited companies whose stocks are traded on the market represent mainly the industrial sector of the economy, only a few of them produce services. It would, therefore, make sense to relate stock price indices to the performance of the industrial sector of the economy. The performance of the industrial sector may be measured by the index of industrial production. Stock price indices are expected to move in tandem with it. The higher the level of the industrial production, other things remaining the same, the more favorable it is for the stock market.

The decision over investment in stocks is also guided by the rate of interest. Investors face a choice between investing in stocks and fixed-income assets like bank deposits or bonds. The

choice is made largely on the basis of rate of interest. If rate of interest is high people are satisfied with fixed-income assets and they show less interest in stocks. A low interest, on the other hand, pushes funds away from the fixed-income assets and towards stocks. Low interest is also desirable to the industry because it reduces cost of production and enhances the level of profit which has favorable impact on stock prices. As a result, an inverse relationship is likely between share price indices and the rate of interest.

Rate of Inflation is another macro variable which might have substantial effect on the stock price level of the country. The increase in the rate of inflation may exert its adverse effect on stock prices at least in three ways. First, it raises interest rate which, in turn, diverts funds from stocks to bonds and other fixed-income assets. Second, inflation reduces purchasing power of the people with lagged wage adjustment. It causes demand deficiency in the economy and recession. Third, inflation, if it exceeds certain tolerable limit, calls for anti-inflationary policies from the part of the government which may retard the growth of the economy and depress profitability of the businesses.

International Factors

In the modern world, economies of different nations are interdependent. Since stock market reflects the condition of the economy, there must be considerable linkage among the bourses across the globe. The process of liberalization and globalization has added fuel to this. Bourses are now more sensitive to international economic phenomena. If, for instance, there is a shock in any part of the world, that immediately spreads to other parts. The oil price hike that has affected the economies across the globe from time to time is an appropriate example of this contagion. However, while this interconnection is true for the real sectors of the economies, it is more so for the financial sectors where markets run simply by people's perception.

In addition to the connective nature of the global economy, the stock market of an economy is more directly affected by the flows of foreign capital. The two major forms of international capital flows are foreign portfolio investment and foreign direct investment. Foreign portfolio investment means investment in domestic financial assets by foreign portfolio investors. The major part of these portfolio flows to India comes in the form of foreign institutional investment dominated by mutual funds and pension funds and the major chunk of these FIIs are invested in equities rather than debt instruments. FDI, on the other hand, involves setting up factories or taking a controlling and lasting stake in productive enterprises in the country. In either case, FDI has the effect of boosting up the productive activities in the country. FDI flows are generally associated with multinational corporations that have operations and facilities across the world.

In India, FII was not allowed till 1991. It was only in September, 1992 that it got the green signal. FDI was permitted even before 1991 but at that time it was subject to stringent restrictions. Much of those restrictions were removed in the post-liberalization era. Right from the beginning net FII flows to India has remained positive except for the year 1998-99. An increasing trend is observed

in the net FII flows into the country. FDI has also increased manifold within the same period. In terms of growth, however, FII stands ahead of FDI.

It is interesting to examine the impact of foreign capital flows on the real sector of the economy and on the stock market. FDI directly affects the real sector of the economy. It stimulates, for instance, production and employment. But the impact of FDI on the stock market is only indirect. The position of FII is diametrically opposite to that of FDI. FII directly affects the stock market. Purchase of equities by the foreign investors directly and immediately raises stock prices. However, the impact of FII on the real sector of the economy is quite ambiguous. FIIs are mostly concentrated on the secondary market for stocks. The inflow of FII boosts up the secondary market which, in turn, might induce industries to issue new stocks in the primary market (because they come to know that if new stocks are floated that will be adequately subscribed by the public). It is only in this indirect manner that FII can influence the level of real (physical) investment and hence the real economic activities in the country. To any economy, therefore, FDI is always more welcome than FII.

Unlike FDI, the problem with FII is that it is highly volatile. The portfolio investors diversify their portfolios by investing in different countries. The flow of FII to a particular country depends on the performance of its stock market relative to other markets. Any time the portfolio managers might like to rearrange their portfolios which would, in turn, destabilize the stock markets of the respective countries. The inflow and outflow of FII are dependent more on the international factors than the domestic macroeconomic indicators. Even in a stable internal macroeconomic situation FII may outflow from the country due to inevitable global economic reasons. This inherent volatility in FII has been an important factor behind most of the turmoils in the Indian stock market in the post-1992 era. The recent stock market crash in 2008, it is widely believed, is the result of global financial melt down which originated in the US sub-prime crisis. FDI, however, does not involve similar problem. When FDI comes, it comes with a long run motive; FDI cannot be withdrawn so easily and conveniently within a short span of time.

Methodology

The movements of stock price indices appear to be determined by both domestic and international factors. The present study formulates a multiple linear regression model to examine the statistical significance of the relevant variables in influencing stock prices. SENSEX is considered to be the dependant variable.

Among the domestic macro variables only index of industrial production, rate of interest and rate of inflation have qualified as explanatory variables. IIP has been chosen instead of GDP because stock market is primarily and directly related to the industrial sector of the country. Rate of interest and rate of inflation also appear as obvious choices. Regarding other macro variables, however, it is very difficult to establish any obvious and strong causal relationships between themselves and the stock market. The variables like the level of employment or wages, for instance, might have their implications for the development of the country, but as far as the stock market is concerned, they

have little to do. In many studies, different measures of money supply have been considered for investigation. Results have, however, differed across studies. The present study abandons them because it considers inclusion of money supply in addition to interest rate and rate of inflation unnecessary. Indeed, money supply affects stock market through these two variables.

FII seems to be the most dominant international factor that affects the stock market of the country. FDI may be more relevant to the real sector of the economy, but, as far as the stock market is concerned, FII plays much more dominant role than FDI. In the present investigation, therefore, FII has been considered as an explanatory variable. As a matter of fact, there are many other international forces which influence the bourses of the country. But they exert their influence largely through the flows of FII. Or, in other words, the effect of any international event on the Indian stock market is actually manifested through FII. Thus, if rate of interest rises in USA, for instance, foreign portfolio investors might withdraw their funds from other markets and pump them in the US market. As a result, stock prices might fall in the Indian market. FII, therefore, represents the international forces that are operative on the Indian stock market. Unlike various earlier studies, however, the present model does not include exchange rate on the ground that the causality running from exchange rate to FII and the stock market seems to be less obvious than the causality other way round.

The stock price model considers four explanatory variables viz., index of industrial production (IIP), rate of interest (ROI), rate of inflation (INFN) and foreign institutional investment (FII). The model is fitted for the period from April,1994 to March,2008. The period has been chosen in view of the economic liberalization in the country which started in 1991 and the inflow of FII which commenced in the month of January, 1993. Monthly data for the period have been considered for the empirical investigation. Data on all the variables have been collected from the RBI Handbook of Statistics on Indian Economy. Interest rate on bank deposits of duration of more than five years have been taken as the representative interest rate for the economy. The rate of inflation has been calculated on the basis of CPI (Consumer Price Index) for urban non-manual employees.

Table I: Summary Statistics for the Period : April 1994 – Mar 2008 (Monthly Data)

Variable	Mean	Median	Standard Deviation	Minimum	Maximum
SENSEX	5763.965	3996.610	3961.380	2866.550	19827.28
IIP	174.2381	163.1500	46.7308	99.9000	304.900
ROI	9.1592	9.0600	2.4938	5.3700	13.0000
INFN	6.4511	5.7950	2.6346	2.0000	15.5100
FII	1636.050	614.8600	3609.300	-13000.98	19823.40

A summary statistics of the dependent variable, SENSEX, and the four explanatory variables has been provided in Table I. It gives an idea about the central tendency and dispersion of the

variables. The correlation matrix (Table II) for the explanatory variables shows that multicollinearity may not be a serious problem in the regression exercise. The values of the correlation coefficients are moderate and in most cases well below 0.50.

Table II: Correlation Coefficients : April 1994 – March 2008 (Monthly Data)

Variable	SENSEX	IIP	ROI	INFN	FII
SENSEX	1.0000	0.8465	-0.2806	-0.1769	0.3472
IIP	0.8465	1.0000	-0.6530	-0.4801	0.3749
ROI	-0.2806	-0.6530	1.0000	0.7474	-0.2804
INFN	-0.1769	-0.4801	0.7474	1.0000	-0.1854
FII	0.3472	0.3749	-0.2804	-0.1854	1.0000

EMPIRICAL FINDINGS

Financial and economic time series are always susceptible to be non-stationary. It is therefore required to run unit root test at the very outset of the regression analysis involving such variables. The present study therefore tests for stationarity of all the variables under consideration, viz., SENSEX, IIP, ROI, INFN and FII. ADF (Augmented Dickey-Fuller) and PP (Phillips-Perron) tests have been deployed for the purpose. The results are summarized in Table III.

Both ADF and PP test confirm that SENSEX, ROI and INFN are all I(1) variables. However, FII is a trend stationary process as the coefficient of the trend variable is significant at 1% level. Strikingly, IIP, which is also a non-stationary series, becomes stationary at first difference according to PP test. ADF test, on the other hand, suggests that IIP has two unit roots. We accept the PP test result as ADF test is sensitive to autocorrelation. It is imperative, therefore, to regress the first difference values of SENSEX (often called stock market returns), the dependent variable, on the first difference values of IIP, ROI and INFN and de-trended values of FII. FII is regressed on time and the estimated residual values yield the de-trended series FII^d. Thus, the appropriate model to be empirically fitted stands as:

$$DSENSEX = \beta_0 + \beta_1 DIIP + \beta_2 DROI + \beta_3 DINFN + \beta_4 FII^d + U$$

Table III: Unit Root Tests

Dependent variable	ADF			PP		
	Constant	Coefficient of the trend variable	t-statistic	Constant	Coefficient of the trend variable	Adjusted t-statistic
SENSEX	-22.4715	1.9722*	-1.4426	-70.5331	2.1310*	-0.5302
DSENSEX	-	-	-7.8895**	-	-	-7.4710**
IIP	-3.1340*	-	4.0388	23.4020**	0.2298**	-3.1884
DIIP	0.4120	0.0211**	-3.1117	1.3037*	-	-18.5564**
DDIIP	-	-	17.7864**	-	-	-
ROI	-	-	-0.8741	-	-	-0.8741
DROI	-	-	-12.8452**	-	-	-12.8452**
INFN	0.3343*	-	-2.5264	-	-	-1.0891
DINFN	-	-	-10.3200**		-	-10.2991**
FII	-680.8776	27.9073**	-12.9503**	-680.8776	27.9073**	-12.9631**

Note:
a) D: First difference; DD: Second difference
b) * : Significant at 5% level
** : Significant at 1% level

Before running the regression, the model has been checked for multicollinearity and volatility clustering. However, the correlation matrix (Table IV) for the transformed variables does not exhibit signs of collinearity. Correlation coefficients are far below the alarming level. Still, for further assurance, multicollinearity has been tested by Variance Inflation Factor (VIF). The values of VIF (Table V) for all the variables are again well below the tolerable level of 10 or even 5. Thus, multicollinearity seems not to be a problem in this investigation.

Table IV: Correlation Coefficients between Transformed Variables : May 1994 – March 2008 (Monthly Data)

Variable	DSENSEX	DIIP	DROI	DINFN	FII[d]
DSENSEX	1.0000	-0.0824	0.0989	-0.1274	0.4349
DIIP	-0.0829	1.0000	0.0622	0.0133	-0.0036
DROI	0.0989	0.0622	1.0000	0.0602	-0.0003
DINFN	-0.1274	0.0133	0.0602	1.0000	-0.0439
FII[d]	0.4349	-0.0036	-0.0003	-0.0439	1.0000

Table V: Test for Multicollinearity		
Regressor	R_i^2	VIF
DIIP	0.0039	1.0039
DROI	0.0074	1.0074
DINFN	0.0056	1.0056
FII^d	0.0019	1.0019
Note: R_i^2 is the coefficient of determination of the regression of a regressor on all other regressors		

. ARCH (Autoregressive Conditional Heteroskedasticity) test for the dependent variable (DSENSEX) appears urgent for examining volatility clustering. Various conditional heteroskedasticity models, viz., Generalized Autoregressive Conditional Heteroskedasticity (GARCH), Integrated GARCH (IGARCH), Threshold GARCH (TARCH), Exponential GARCH (EGARCH), Power ARCH (PARCH) and Component GARCH (CGARCH) have been attempted for that purpose and ultimately the most appropriate one has been chosen on the basis of formal criteria, viz., AIC (Akaike Information Criterion) and SBC (Schwarz Bayesian Criterion). Table VI presents AIC and SBC values for some selective models. In what follows, a Threshold GARCH (1,1) (i.e., TARCH) model with threshold order one explains best the conditional variance. Of all the alternative models, the AIC and SBC values are the smallest for the TARCH model (Table VI). The estimated variance equation appears as

$$\sigma_t^2 = \underset{(1.1056)}{2520.326} + \underset{(13.0406)^{**}}{0.8710\,\sigma_{t-1}^2} + \underset{(2.3248)^{*}}{0.2792\,\varepsilon_{t-1}^2} \underset{(-2.2943)^{*}}{-0.2702\,\varepsilon_{t-1}^2 I_{t-1}}$$

where the values in parentheses show the respective values of the t-statistic. σ_t^2 and ε_{t-1}^2 are the conditional variance and the squared residual in period t respectively and I_{t-1} is a dummy variable that captures the asymmetric effect of a news on the conditional variance. I_{t-1} is equal to 1 if $\varepsilon_{t-1} < 0$ and is equal to zero if $\varepsilon_{t-1} \geq 0$.

The selected model has been subjected to diagnostic checks. Ljung-Box (LB) test on standardized residuals and squared standardized residuals have been used to examine the fitting of the model. However, for standardized residuals, values of Auocorrelation (AC), and Partial autocorrelation (PAC) at different lags (up to 40) are all considerably small and Q statistic insignificant at 1% level implying that residuals are serially uncorrelated (Table A1). The small values of AC, PAC, and the statistical insignificance of Q for squared standardized residuals further ensures the absence of remaining GARCH effect (Table A2).

Table VI: ARCH Tes-Model Selection		
Model	AIC	SBC
GARCH (0,1)	14.5933	14.7300
GARCH (1,0)	14.4205	14.5512
GARCH (1,1)	14.3883	14.5376
GARCH (1,2)	14.5832	14.7512
GARCH (2,1)	14.3996	14.5677
GARCH (2,2)	14.4528	14.6395
GARCH (0,2)	14.5171	14.6664
GARCH (2,0)	14.4323	14.5816
IGARCH (1,1)	14.3508	14.5188
TARCH (1,1) Assymmetry order = 1	14.3334	14.5014
TARCH (1,1) Assymmetry order = 2	14.3430	14.5297
EGARCH (1,1) Assymmetry order = 1	14.3409	14.5089
EGARCH (1,1) Assymmetry order = 2	14.3465	14.5332
PARCH (1,1) Assymmetry order = 1	14.3447	14.5314
CGARCH (1,1)	14.4197	14.6064
CGARCH (1,1) Assymmetry order = 1	14.4199	14.6253

In the proposed stock price model, the dependent variable DSENSEX exhibits ARCH effect. Specifically, the conditional variance follows TARCH model with asymmetry order one. It will be improper therefore to apply OLS to estimate the model. Estimation has been suitably done by ML-ARCH method and the estimated relationship has come out as

$$\text{DSENSEX} = 54.9460 + 1.5246\ \text{DIIP} + 33.7414\ \text{DROI} - 32.5611\ \text{DINFN} + 0.0524\ \text{FII}^{d}$$
$$(2.6144)^{**}\quad (0.6023)\quad (0.4875)\quad (-1.2015)\quad (3.8498)^{**}$$

$R^2 = 0.1857$ Adjusted $R^2 = 0.1445$

$F = 4.5055^{**}$ D.W. = 1.2980

The explanatory power of the model is satisfactory. R^2 is not very low and more important, F-statistic is significant at 1% level. Except DROI, the coefficients of all other explanatory variables have their expected signs. The positive sign of the coefficient of DROI is surprising and perhaps has its explanation in frequent policy intervention by the government. The fall in the stock price level is often regarded as the reflection of the slowing down of the economy and calls for correction. The

government attempts to boost the economy with expansionary monetary policy cutting the rate of interest. However, only the coefficient of FII^d is significant at 1% level. The coefficients of all other variables are insignificant even at higher levels of significance. It appears that the stock market is guided mainly by foreign institutional investment.

CONCLUSION

The empirical results show that the Indian stock market is governed mainly by the international factors that manifest through FII flows. Domestic macro variables, viz., industrial production index, rate of interest and inflation do not have significant influence on the stock prices. This is a cause for concern. International factors move according to the international economic situation. Foreign institutional investment, for instance, is inherently volatile. A foreign institutional investor typically holds a diversified portfolio spread over many countries. At any point of time, it may like to take its money in and out of a single country depending upon the performance of its stock market relative to the world market. The inflow of foreign capital to India, for that matter, depends, to some extent, on the domestic economic conditions, but to a great extent, on the global economic and financial scenario. The strength of the domestic factors seems to be negligible when compared to the combined effect of all the international forces.

The sensitivity of the stock market to international events has serious policy implications. The government of India cannot restrict FII because that contradicts the spirit of globalization. At the same time, it is hesitant to let its bourses be guided by FII because that makes the market volatile and undermines investors' confidence in stocks. The vulnerability of the Indian stock market to international forces appears to be an ill consequence of globalization.

APPENDIX

Table A1: Diagnostic Test on Standardized Residuals

Lag	AC	PAC	Q-statistic
1	0.002	0.019	12.188
2	0.002	0.021	12.185
3	0.018	-0.028	11.112
4	-0.002	-0.012	11.113
5	-0.002	0.002	11.113
6	0.102	0.110	12.938
7	0.006	-0.039	12.943
8	0.052	0.037	13.419
9	0.083	0.075	14.637

Table A1: Diagnostic Test on Standardized Residuals			
Lag	AC	PAC	Q-statistic
10	0.088	0.055	16.031
11	0.200	0.170	23.250
12	0.115	0.023	25.658
13	0.137	0.093	29.101
14	0.027	-0.030	29.232
15	-0.030	-0.057	29.398
16	-0.020	-0.001	29.472
17	-0.022	-0.049	29.565
18	-0.009	-0.003	29.580
19	-0.012	-0.051	29.607
20	0.047	0.038	30.031
21	0.070	0.042	30.977
22	0.143	0.075	34.967
23	0.070	0.003	35.920
24	0.102	0.044	37.988
25	-0.014	-0.040	38.027
26	0.018	0.024	38.089
27	-0.020	-0.010	38.167
28	-0.073	-0.077	39.260
29	0.012	0.054	39.292
30	0.002	-0.016	39.293
31	0.026	0.012	39.438
32	0.010	-0.038	39.460
33	0.115	0.076	42.254
34	0.033	-0.015	42.484
35	0.146	0.088	47.040
36	0.041	0.013	47.396
37	0.070	0.050	48.466
38	-0.104	-0.116	50.820
39	-0.044	-0.000	51.253
40	-0.013	0.029	51.293

Table A2: Diagnostic Test on Squared Standardized Residuals			
Lag	AC	PAC	Q-statistic
1	-0.036	-0.036	0.2226
2	0.054	0.053	0.7174
3	-0.057	-0.054	1.2791
4	-0.041	-0.048	1.5761
5	0.024	0.027	1.6787
6	-0.033	-0.029	1.8641
7	0.023	0.013	1.9553
8	-0.096	-0.091	3.5803
9	0.103	0.096	5.4808
10	0.024	0.039	5.5838
11	0.113	0.099	7.8804
12	-0.017	-0.014	7.9352
13	-0.014	-0.007	7.9694
14	0.057	0.064	8.5763
15	-0.043	-0.025	8.9195
16	0.031	0.007	9.1009
17	-0.055	-0.025	9.6688
18	-0.003	-0.011	9.6701
19	0.010	0.023	9.6911
20	0.043	0.023	10.042
21	0.011	-0.003	10.066
22	0.025	0.030	10.192
23	-0.033	-0.044	10.407
24	0.059	0.069	11.101
25	-0.004	-0.016	11.103
26	0.080	0.092	12.395
27	-0.016	-0.009	12.450
28	0.065	0.077	13.300
29	-0.037	-0.035	13.582
30	0.021	0.022	13.677
31	0.014	0.004	13.720
32	-0.083	-0.066	15.162
33	-0.006	-0.037	15.169

Table A2: Diagnostic Test on Squared Standardized Residuals			
Lag	AC	PAC	Q-statistic
34	-0.003	0.028	15.171
35	-0.063	-0.110	16.006
36	0.057	0.061	16.709
37	-0.041	-0.066	17.067
38	-0.068	-0.087	18.074
39	-0.004	-0.010	18.078
40	0.039	0.028	18.411

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HOW DOES PRIOR INFORMATION AFFECT ANALYST FORECAST HERDING?

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ABSTRACT

This research investigates how prior information affects analyst herding. Results indicate the probability of herding among analysts is greater with large information shocks. Evidence also shows that analysts are more likely to herd in their earnings forecast revisions when their current outstanding forecasts deviate more from the consensus mean and in the presence of strong observable signals. In general, analysts with current outstanding forecasts that are optimistic are more likely to issue revised forecasts that are also optimistic.

INTRODUCTION

Market response to analyst forecasts suggests that analysts are viewed by investors as knowledgeable information intermediaries. However, herding by analysts can reduce the information conveyed by their forecasts since analysts who herd may not fully use their private information. (See Devenow & Welch, 1996 and Bikhchandani & Sharma, 2001 for a review of the literature.) The purpose of this study is to investigate the circumstances under which analysts herd in their earnings forecasts. In particular, this study examines how an analyst's herding decision in an annual earnings forecast is affected by prior observable signals released by other analysts and by uncertainty related to the analyst's current outstanding forecast.

Herding theories suggest that issuing a forecast that is inconsistent with the analyst's private information could be the optimal equilibrium for analysts who are concerned about their reputations (e.g., Graham, 1999; Scharfstein & Stein, 1990; Trueman, 1994). For example, in the model of Scharfstein and Stein (1990), it could be better for an analyst (manager or decision maker) to simply follow the decision of other analysts because taking a similar action as others suggests to investors that the analyst has received a signal that is correlated with others, and therefore the analyst is more likely to look informed (or smart). Indeed, empirical evidence shows that analysts with weak forecasting ability are more likely to herd than analysts with strong forecasting ability. In that vein, Hong, Kubik, and Solomon (2000) find that herding is negatively related to analyst experience. In addition, Clement and Tse (2005) show that herding is also related to other analyst characteristics

such as brokerage size, forecast frequency, and the number of companies and industries that an analyst follows.

While previous empirical studies examine the cross-sectional differences in analyst characteristics as determinants of analysts' forecast herding, analytical studies suggest that prior observable signals released by other analysts are also important determinants in an analyst's herding decision. For example, Bikhchandani and Sharma (2001) expect that an analyst's herding decision is sensitive to external information shocks. In particular, the characteristics of prior signals affect an analyst's incentive to discard her private information and instead mimic others, because an analyst's herding decision depends on the analyst's assessed risk to be regarded as incompetent by her clients if she issues a forecast inconsistent with prior signals. Similarly, Graham (1999) and Trueman (1994) expect that analysts have more incentive to herd if they observe prior signals that are highly correlated or if the prior information is inconsistent with the analyst's private information. How prior information affects analysts' herding decisions, however, has not been rigorously investigated. We attempt to fill this gap in the research by testing the empirical implications of the theoretical models with a sample of individual analysts' annual earnings forecasts. A better understanding of the relation between prior information and analyst herding will allow investors to better interpret analyst forecasts.

We first examine how the *information shock* related to other analyst forecasts and the *pressure to conform* relative to an analyst's current outstanding forecast affect herding in the analyst's subsequent forecast. Following Stickel (1990), we measure information shock by the change in the consensus forecast of other analysts since the date of an analyst's current outstanding forecast. The pressure to conform relative to an analyst's current outstanding forecast is measured as the deviation of the forecast from the consensus forecast. We contend that the risk for an analyst to be regarded as uninformed or incompetent is high if the deviation of her current outstanding forecast from the consensus forecast is large, thus there is high pressure to conform.

Next, we examine how the *strength of prior signals* affects analyst herding behavior. The strength of prior signals is measured by the change in analyst forecast dispersion and by the number of analyst forecasts issued since the date of an analyst's current outstanding forecast. We argue that the new information contains a strong signal about future earnings if there is convergence in other analyst forecasts or if the change in the consensus forecast is based on a large number of analysts. Our results show that analyst forecasts are more likely to converge when they observe a large magnitude consensus change, providing empirical evidence that is consistent with Bikhchandani and Sharma's (2001) expectation. In addition, we find that analysts are more likely to herd if the deviation of the analyst's current forecast from consensus is large or if the consensus forecast moves away from the analyst's current forecast. These results suggest that analysts feel greater pressure to herd when faced with greater risk of be regarded as uninformed or incompetent by investors. Finally, strong prior signals are more likely to lead analysts to move toward the consensus forecast. Our results are robust to controlling for characteristics of individual analyst forecast ability.

This study contributes to the herding literature in at least two ways. First, there is a need for a broader understanding of analyst herding. Hong et al. (2000) and Clement and Tse (2005) show analyst characteristics related to analyst forecast ability are strongly associated with herding. These studies conclude that weak forecast ability causes analysts to seek safety in forecasts that are close to the consensus, while strong analysts are less bounded by the consensus. While these studies find evidence regarding *who* herds in earnings forecasts, they are silent about *when* analysts herd. We extend our understanding of herding by showing that an analyst is more likely to herd when she observes prior signals that are inconsistent with her current outstanding forecast.

Second, our research contributes to the general debate about herding behaviors. Theoretical studies posit that herding is conditional on prior observable signals inferred from actions taken by predecessors (Graham, 1999; Trueman, 1994). The results suggest that herding is positively associated with the information shock related to other analyst forecasts and the strength of prior signals. These prior signals and forecast uncertainty are public information available to all investors. Thus, prior public information contains predictive information about future herding behavior and can help market participants better evaluate analysts' earnings forecast.

The remainder of the paper is organized as follows: the next section reviews prior literature; the sample selection process is then described; our research methods are explained in the following section; we next present our results; and lastly we summarize and conclude.

PRIOR LITERATURE AND HYPOTHESIS DEVELOPMENT

Analytical studies regarding herding behaviors suggest that managers (or analysts) attempt to take similar actions (or issue similar forecasts) in order to enhance their reputations by sending signals that they have private information correlated with market leaders' information. Scharfstein and Stein (1990) and Trueman (1994) show that there exists an equilibrium in which an analyst mimics other analyst forecasts or simply moves toward consensus forecast even though her private information tells her otherwise. The intuition of this behavior is that an analyst's deviation from other analysts' forecasts can lead market participants to believe the analyst is uninformed (or incompetent). If the common decision turns out to be incorrect it will be attributed to an unlucky draw of the same signal from an information distribution, and the analyst can share the blame instead of being regarded as an uninformed analyst.

Hong et al.(2000) test the link between analyst career concerns and herding behaviors. They find that career concerns are important incentives for herding in analysts' earnings forecast by showing that less experienced analysts are more likely to issue herding forecasts and are also more likely to experience job termination. Clement and Tse (2005) extend Hong et al. by examining how those analyst characteristics that reflect analyst forecasting ability, such as career experience, the number of firms and industries that an analyst follows, prior forecast accuracy, and brokerage firm size, are associated with herding behaviors in annual earnings forecasts. They find analyst

characteristics that represent strong forecasting ability are negatively associated with analyst herding behaviors.

Previous empirical studies, however, are silent about how prior information affects herding. Empirical evidence suggests that an analyst's next forecast is affected by prior public information. Stickel (1990) documents that an analyst's forecast revision is significantly affected by the market's expectation for change, measured by the change in consensus forecast. In addition, he finds that the market pressure on analysts to revise, measured by the deviation of an analyst's outstanding forecast from the consensus forecast, leads analysts to move toward the consensus forecast. Stickel (1992) does find, however, that members of the *Institutional Investor* All-American Research Team are less likely to be affected by the other analysts' forecast revisions. Although these studies examine how analyst forecast revisions are related to prior information, they do not examine analyst forecast revisions and prior information in the context of herding.

One focus of this study then, is to examine how new information released by other analysts affects an analyst's herding decision. Analytical studies suggest that the herding decision depends on the prior signals observed as well as the analyst's private information (e.g., Graham, 1999; Scharfstein & Stein, 1990; Trueman, 1994 among others). An empirical implication of Scharfstein and Stein's (1990) model is that an analyst who is uncertain about her forecasting ability is sensitive to the arrival of new information because the analyst's strategy is to defer to the action of predecessors as soon as she believes that prior signals are more informative than her own information. Bikhchandani and Sharma (2001) predict that herding is fragile and very sensitive to information shock, such as the arrival of informed investors or the release of new public information. Thus, we predict that analysts are more likely to herd when they observe a large magnitude of new information and test the following hypothesis:

H1: Analysts are more likely to herd when the magnitude of new information is large.

Another implication of Scharfstein and Stein's (1990) model is that an analyst will perceive higher pressure if her forecast deviates more from other analyst forecasts. That is to say, because a goal for an analyst is to maximize her own expectation of her client's end-of-period probability assessment that her ability is strong, the uncertainty that the analyst perceives is higher if her outstanding forecast is farther from consensus forecast. Stickel (1990) finds that analysts whose forecasts deviate more from the consensus are more likely to issue subsequent forecasts close to the consensus forecast. He concludes that analysts are under pressure to issue forecasts in line with the consensus. However, Stickel does not examine the deviation of analyst forecasts from the consensus in the context of herding. We expect that an analyst is more likely to herd if her current forecast has greater deviation from other analyst forecasts, and test the next hypothesis:

H2: Analysts are more likely to herd when their current outstanding forecast differs substantially from the previous consensus forecast.

We also examine how a change in market expectations affects analyst herding behavior. If an analyst observes prior signals that are inconsistent with her current belief, she will perceive higher pressure to herd. For example, if an analyst whose forecast is optimistic relative to the market consensus observes a negative consensus change, maintaining her current forecast implies that her private information is inconsistent with the market expectation. This will provide an incentive for the analyst to revise her forecast closer to the consensus forecast. Thus, we expect that analysts are more likely to herd when market expectations move away from the analyst's current outstanding forecast and test this hypothesis:

H3: Analysts are more likely to herd when the consensus forecast moves away from their current outstanding forecasts.

Our fourth hypothesis tests the effect of the strength of prior signals on herding. Graham (1999) suggests that the effect of prior signals on herding increases with the strength of prior earnings expectations. The strength of prior information becomes stronger if informative signals are highly correlated or prior signals are made by a large group of analysts. Similarly, Trueman (1994) suggests that analysts are more likely to herd when there is little uncertainty in prior forecasts by other analysts. Intuitively, this is because it would be risky for an analyst to reveal her private information that is inconsistent with other analysts if there is high consensus among analysts. If there is low consensus in analyst forecasts, an analyst would feel free to issue a forecast inconsistent with those of others. Thus, we expect that analyst forecast herding is negatively associated with the strength of prior signals and test:

H4: Analysts are more likely to herd in the presence of strong observable signals by other analysts.

SAMPLE SELECTION

Annual earnings forecasts from 1990 to 2005 are obtained from I/B/E/S. Following Clement and Tse (2005), we require that forecasts are issued no earlier than 200 days, and no later than 30 days, before the fiscal year-end. Like prior research, we use the last forecast that an analyst issues in a particular fiscal year (Clement & Tse, 2005; O'Brien & Bhushan, 1990; Sinha, Brown, & Das, 1997). We require that a minimum of three analysts follow a firm so that two forecasts can be used in the calculation of the mean (consensus) forecast for comparison with another analyst's revised forecast. To facilitate comparison across companies, we deflate a forecast revision (or mean forecast revision) by the prior forecast (or prior mean forecast) so that it represents the percentage change

in the forecast (or mean forecast). We eliminate observations for which the absolute value of the deflated analyst forecast revision and the mean forecast revision are greater than 2 (Agrawal, Chadha, & Chen, 2006).

Table 1 reports the frequency of forecasts by year for the sample. The requirements outlined above yield a sample of 214,039 analyst-firm-year observations with 2,125 analysts per year, on average, and an average of 2,159 firms per year. The average number of analyst-firm-year observations during the sample period is 13,377.

Table 1

Year		# of Analysts		# of Firms		# of Observations
1990		1,437		1,633		9,338
1991		1,710		1,672		12,391
1992		1,661		1,710		12,850
1993		1,629		1,796		12,726
1994		1,715		1,995		12,348
1995		1,841		2,173		12,862
1996		1,993		2,292		13,372
1997		2,229		2,502		13,907
1998		2,423		2,619		14,801
1999		2,571		2,512		14,415
2000		2,522		2,283		13,292
2001		2,399		2,170		12,649
2002		2,264		2,147		12,517
2003		2,355		2,192		13,628
2004		2,563		2,365		16,504
2005		2,693		2,476		16,439
Mean		2,125		2,159		13,377

RESEARCH DESIGN AND MODEL DEVELOPMENT

Two approaches have been used in prior research to measure herding in earnings forecasts. One, employed by Gleason and Lee (2003) and Clement and Tse (2005), defines bold forecasts based on the position of a revised forecast relative to the analyst's current outstanding forecast and the mean consensus forecast immediately prior to forecast revision. More specifically, Gleason and Lee define a forecast as bold if an individual analyst forecast is larger (smaller) than both her own

current forecast and the consensus forecast immediately prior to the forecast revision. Following these studies, our first measure of forecast boldness is defined as follows:

$$Bold1 = \quad 1 \text{ if } \left(F_{i,j,t} > F_{i,j,t-v} \text{ and } F_{i,j,t} > \overline{F}_{i,j,t-1}\right) \text{ or } \left(F_{i,j,t} < F_{i,j,t-v} \text{ and } F_{i,j,t} < \overline{F}_{i,j,t-1}\right),$$
$$0 \text{ otherwise,}$$

where $F_{i,j,t}$ is analyst *i*'s revised annual EPS forecast for firm *j* issued on date *t*; $F_{i,j,t-v}$ is analyst *i*'s prior EPS forecast for firm *j* issued *v* days before revision date *t*; and $\overline{F}_{i,j,t-1}$ is analyst mean consensus forecast measured by the average of analysts' most recent ESP forecasts for firm *j* on day *t-1*.

The other approach is to use the deviation of an analyst's forecast from the consensus forecast. Prior research assumes that boldness in analyst forecasts increases with the distance of the forecast from consensus forecast (Clement & Tse, 2005; Graham, 1999; Hong, et al., 2000). Our second measure of bold forecast is based on the deviation of an analyst's forecast revision from the mean consensus forecast. If the distance of an analyst's revised forecast from the mean consensus forecast is larger than that of the analyst's current outstanding forecast relative to the prior consensus forecasts, we define it as a bold forecast. This bold forecast measure is intuitive, as herding implies that an analyst simply moves toward the consensus forecast. Any forecast that moves away from the consensus forecast is defined as bold. Formally, bold is also measured as follows:

$$Bold2 = \quad 1 \text{ if} \left|F_{i,j,t-v} - \overline{F}_{i,j,t-v-1}\right| < \left|F_{i,j,t} - \overline{F}_{i,j,t-1}\right|, 0 \text{ otherwise}$$

We use the measures of boldness defined above to extend the extant literature on herding. Results of our research provide greater insight into analyst herding behavior. The next section develops our model.

We base our model on that used by Stickel (1990), which predicts an analyst's forecast revision by using information observed by the analyst. Stickel suggests that an analyst's forecast revision is a function of new information and market pressure for a forecast revision. He measures new information by the change in the mean consensus forecast since the date of the analyst's current outstanding forecast, and measures market pressure by the deviation of the analyst's current outstanding forecast from the mean consensus forecast. However, Stickel does not examine how these factors affect the boldness of an analyst's forecast. Thus, we modify the model developed by Stickel to predict boldness in analyst forecasts as follows:

$$Bold_{i,j,t} = \beta_0 + \beta_1 AbsChgCon_{j,t-1} + \beta_2 AbsDeviation_{i,j,t-v} + \beta_3 lnCoverage_j + \beta_4 DaysElapsed_{i,j,t} + \beta_5 ForHorizon_{i,j,t} + \varepsilon_{i,j,t} \quad (1)$$

where $Bold_{i,j,t}$ is 1 (0) if the forecast revision of analyst i for stock j on date t is classified as bold (herding). $AbsChgCon_{j,t-1}$ is the absolute value of the change in the consensus forecast of other analysts following firm j between the days t and day $t - v$. It is measured as the absolute value of $(\overline{F}_{j,t-1} - \overline{F}_{j,t-v-1})/\overline{F}_{j,t-v-1}$ where $\overline{F}_{j,t-1}$ is the mean consensus forecast on day $t - 1$. *AbsChgCon* is a proxy for new information to analysts since the issuance of analyst i's forecasts on day $t - v$. $AbsDeviation_{i,j,t-v}$ is the difference between the consensus forecast for firm j and analyst i's forecast on day $t - v$, measured as the absolute value of $(F_{i,j,t-v} - \overline{F}_{j,t-v-1})/\overline{F}_{j,t-v-1}$ where $F_{i,j,t-v}$ is analyst i's annual earnings forecast on day $t - v$. It reflects uncertainty related to the analyst's current outstanding forecast. $lnCoverage_j$ is the natural log of the number of analysts following firm j in a particular year. $DaysElapsed_{i,j,t}$ is the number of days elapsed between analyst i's forecast of firm j's earnings and the last forecast by any analyst following firm j in that particular year. $ForHorizon_{i,j,t}$ is the number of days from the forecast of analyst i for stock j on date t to the end of the fiscal period.

The consensus forecast $\overline{F}_{j,t-1}$ is calculated as the simple mean of the earnings forecasts of all other analysts as of day $t - 1$, excluding analyst i, for firm j. Only the most recent forecast issued by each analyst is used in the consensus forecast calculation. To avoid the stale forecast problem, only forecasts that are issued within 90 days before the forecast issuance day are used to compute the mean forecast and forecast revision. For the cross-sectional comparison, each variable is scaled by the prior forecast or by the prior mean forecast.

Three of the variables, *lnCoverage*, *DaysElapsed* and *ForHorizon*, are included in the model as control variables. Prior research suggests that competition among analysts can increase the private information production activities among analysts (Jeffery S. Abarbanell, Lanen, & Verrecchia, 1995; Lang & Lundholm, 1996). Thus, a positive coefficient on *lnCoverage* would support the idea that analysts respond to greater competition by increasing their production of private information. Since Barron et al. (2002) and Cooper et al. (2001) show that the timing of a forecast can affect analysts' private information production activities, we also include *DaysElapsed* and *ForHorizon* to control for the timing of the forecast.

Next, we extend the prediction model by examining the effect of the nature of new information on analyst forecast revisions. Hypothesis 3 predicts that an analyst has a greater incentive to herd if she observes a market signal that is inconsistent with her current outstanding forecast. A change in the consensus may have different implications to analysts, depending on their

current opinions on future earnings. For example, if analyst A's current forecast is optimistic (greater than mean consensus forecast), an upward consensus forecast revision means the other analysts' beliefs were revised toward analyst A's current forecast. In this case, analyst A may have little incentive to revise her forecast to imitate other analyst forecasts as she learns little from her observation of the consensus change. Or perhaps she will issue another forecast that is consistent with her own private information (Graham, 1999). On the other hand, a downward consensus revision means a greater deviation of analyst A's forecast from other analysts' beliefs. This forecast revision means the market expectation has changed in a way that is inconsistent with the analyst's current belief. In this case, she may have a greater incentive to herd as she perceives greater pressure to revise her forecast.

Research also shows that analysts tend to issue favorable rather than unfavorable forecasts to maintain brokerage firm affiliation or to get information access to managers (e.g., Das, Levine, & Sivaramakrishnan, 1998; Dugar & Nathan, 1995; Lin & McNichols, 1998; Womack, 1996). Avoidance of issuing unfavorable forecasts can result in differential analyst reactions to bad news, such as self-selection in the coverage decision (Das, Guo, & Zhang, 2006; McNichols & O'Brien, 1997) or analysts' underreaction (overreaction) to bad (good) news (e.g.,Jefferey S. Abarbanell & Bernard, 1992; Brown, 2001; Easterwood & Nutt, 1999).

We explore the role of prior opinion and investigate how the characteristics of new information affect an analyst's response by dividing forecast revisions into two groups based on the sign of consensus revision: upward and downward consensus revisions. For each subgroup, we examine whether an individual analyst's current optimistic forecast is related to her revision by using a dummy variable to represent optimistic (pessimistic) forecast. The dummy variable *Optimism* has a value of one if the analyst's outstanding forecast is greater than the prior mean consensus forecast, zero otherwise. Similarly, the dummy variable *Pessimism* has a value of one if the analyst's outstanding forecast is less than the prior mean consensus forecast, zero otherwise. We also investigate the interaction of *Optimism (Pessimism)* with upward (downward) *AbsChgCon* and estimate the following model:

$$\begin{aligned} Bold_{i,j,t} = {} & \beta_0 + AbsChgCon_{j,t-1} + \beta_2 AbsDeviation_{i,j,t-v} + \beta_3 Optimism(Pessimism)_{i,j,t-v} \\ & + \beta_4 AbsChgCon_{j,t-1} \times Optimism(Pessimism)_{i,j,t-v} + \beta_5 lnCoverage_j \\ & + \beta_6 DaysElapsed_{i,j,t} + \beta_7 ForHorizon_{i,j,t} + \varepsilon_{i,j,t} \end{aligned} \quad (2)$$

where $Optimism_{i,j,t-v}$ is 1 if an analyst's current outstanding forecast is greater than the prior mean consensus forecast, 0 otherwise, and $Pessimism_{i,j,t-v}$ is 1 if an analyst's current outstanding forecast is smaller than the prior mean consensus forecast, 0 otherwise.

Our next prediction model includes the strength of prior information. We measure the strength of new information by the change in analyst forecast dispersion (*ChgDispersion*) and the

number of analyst forecasts that are used to compute the mean consensus forecast change (*NumIssues*). If analysts' private information is correlated, their forecast revisions will also be highly correlated and the forecast dispersion will decrease. Therefore, we argue that there is strong new information if the change in consensus forecast is associated with lower forecast dispersion. In addition, given a large magnitude consensus change, we contend that the strength of the new information signal is greater if the change in consensus is made by a larger number of analysts. We further argue that there will be a lower probability of boldness in analyst forecasts if prior information has greater strength. We test our hypothesis by estimating the following model:

$$\begin{aligned} Bold_{i,j,t} = {} & \beta_0 + \beta_1 AbsChgCon_{j,t-1} + \beta_2 AbsDeviation_{i,j,t-v} + \beta_3 Optimism_{i,j,t-v} \\ & + \beta_4 AbsChgCon_{j,t-1} \times Optimism_{i,j,t-v} + \beta_5 AbsChgCon_{j,t-1} \times Convergence_{j,t-1} \\ & + \beta_6 AbsChgRev_{j,t-1} \times NumIssuer_{j,t-1} + \beta_7 lnCoverage_j + \beta_8 DaysElapsed_{i,j,t} \\ & + \beta_9 ForHorizon_{i,j,t} + \varepsilon_{i,j,t} \end{aligned} \tag{3}$$

where $Convergence_{j,t-1}$ is the change in the dispersion ($StdDev_{j,t-v-1} - StdDev_{j,t-1}$) of the forecasts used to determine the consensus forecast (note that a larger value indicates greater convergence). $NumIssuer_{j,t-1}$ is the number of analyst forecasts that are used to compute the mean consensus forecast change.

Our final prediction model examines the above variables while controlling for analyst characteristics. Clement and Tse (2005) show that various analyst characteristics are related to analyst forecasting ability. Model (4) controls for an analyst's firm and general experience, lagged forecast accuracy, the size of the brokerage that employs the analyst, and the frequency with which the analyst issues forecasts for the firm. Following Clement and Tse, all analyst characteristics are scaled and converted into values between zero and one for use in the regressions. To test the robustness of our results to inclusion of analyst characteristics, we estimate the following model:

$$\begin{aligned} Bold_{i,j,t} = {} & \beta_0 + \beta_1 AbsChgCon_{j,t-1} + \beta_2 AbsDeviation_{i,j,t-v} + \beta_3 Optimism_{i,j,t-v} \\ & + \beta_4 AbsChgCon_{j,t-1} \times Optimism_{i,j,t-v} + \beta_5 AbsChgCon_{j,t-1} \times Convergence_{j,t-1} \\ & + \beta_6 AbsChgRev_{j,t-1} \times NumIssuer_{j,t-1} + \beta_7 lnCoverage_j + \beta_8 DaysElapsed_{i,j,t} \\ & + \beta_9 ForHorizon_{i,j,t} + \beta_{10} GeneralExperience_{i,j,t} + \beta_{11} FirmExperience_{i,j,t} \\ & + \beta_{12} LagForAccuracy_{i,j,t-1} + \beta_{13} BrokerageSize_{i,j,t} + \beta_{14} Frequency_{i,j,t} \\ & + \beta_{15} FirmCoverage_{i,j,t} + \varepsilon_{i,j,t} \end{aligned} \tag{4}$$

where $GeneralExperience_{i,j,t}$ is a measure of analyst *i*'s analyst career experience relative to other analysts following firm *j*. It is calculated as the number of quarters of analyst career experience for

analyst *i* as of year *t* minus the minimum number of quarters of analyst career experience for other analysts following firm *j* in year *t*, with this difference scaled by the range of quarters of analyst career experience for analysts following firm *j* in year *t*. $FirmExperience_{i,j,t}$ is a measure of analyst *i*'s firm-specific experience. It is calculated as the number of quarters of firm-specific experience for analyst *i* following firm *j* as of year *t* minus the minimum number of quarters of firm-specific experience for analysts following firm *j* in year *t*, with this difference scaled by the range of quarters of firm-specific experience for analysts following firm *j* in year *t*. $LagForAccuracy_{i,j,t-1}$ is a measure of analyst *i*'s prior forecast accuracy for firm *j*. It is calculated as the maximum absolute value of forecast error for analysts who follow firm *j* in year $t - 1$ minus the absolute value of forecast error for analyst *i* following firm *j* as of year $t - 1$, with this difference scaled by the range of forecast error for analysts following firm *j* as of year *t -1*. $BrokerageSize_{i,j,t}$ is a measure of the analyst's brokerage firm size in year *t*. It is calculated as the number of analysts employed by analyst *i*'s brokerage firm in year *t* minus the minimum number of analysts employed by the brokerage firms of other analysts following firm *j* in year *t*, with this difference scaled by the range of brokerage sizes for analysts following firm *j* in year *t*. $Frequency_{i,j,t}$ is a measure of analyst *i*'s forecast frequency for firm *j*. It is calculated as the number of firm *j* forecasts made by analyst *i* during year *t* minus the minimum number of firm *j* forecasts by analysts following firm *j* during year *t*, with this difference scaled by the range of the number of firm *j* forecasts issued by analysts during year *t*. $FirmCoverage_{i,j,t}$ is a measure of the number of companies analyst *i* follows in year *t*. It is calculated as the number of companies followed by analyst *i* who follows firm *j* in year *t* minus the minimum number of companies followed by analysts who follow firm *j* in year *t*, with this difference scaled by the range in the number of companies followed by analysts following firm *j* in year *t*.

We estimate the four models presented above to examine the determinants of boldness (herding) in analyst forecasts. Our analysis provides greater insight into analyst herding behavior. The next section presents the results of our research.

RESULTS

Table 2 reports descriptive statistics on boldness, characteristics of analyst forecasts, and analyst characteristics. Based on the *Bold1* definition, 72.5% of the 214,046 analyst forecast revisions are classified as bold forecasts. This percentage of boldness in analyst forecasts is close to that of Clement and Tse (2005), who find that 73.3% of forecasts are bold. The percentage of forecast revisions classified as bold is lower using the definition of *Bold2* (43.6%).

Panel B of Table 2 presents descriptive statistics for the analyst forecast characteristics. Results show that the mean consensus forecast changes (*ChgCon*) by a mean (median) value of -4.1% (-0.4%). The negative value of the mean consensus change implies that analysts who issue optimistic forecasts tend to revise downward. This result is consistent with previous empirical research finding that analysts issue optimistic forecasts in early periods and revise downward afterward (Bradshaw, 2002). When we examine the relation between the analysts' current

outstanding forecasts and the prior mean consensus forecasts, 47.0% are classified as optimistic forecasts (*Optimism* dummy variable = 1), meaning they are greater than the prior mean consensus forecast. The mean (median) deviation between an analyst's forecast on day $t - v$ and the consensus forecast on day $t - v - 1$ (*Deviation*) is 2.5% (0.4%), which represents the pressure on the analyst to revise her forecast. Firms in our sample are covered, on average, by 18.9 (17.0) analysts. The average number of forecasts issued by other analysts since the date of the analyst's current outstanding forecast on day *t-v* (*NumIssuer*) is 15.6 (12.0). That means, on average, an analyst revises her forecast after observing about 16 forecasts issued by other analysts. The mean (median) value of the change in forecast dispersion (*Convergence*) is 0.072 (0.133), meaning analysts are more likely to converge over time. On average, 9.4 (5.0) days have elapsed since the last forecast by any analyst following the firm (*DaysElapsed*), and the average number of days until the fiscal year-end (*ForHorizon*) is 88.3 (71.0).

Table 2

Parameter	Mean	Median	Std Dev
Panel A: Bold Forecasts for N = 214,046			
Bold1	0.725	1.000	0.447
Bold2	0.436	0.000	0.496
Panel B: Forecast Characteristics			
ChgCon	-0.041	-0.004	0.216
Optimism	0.470	0.000	0.499
Deviation	0.025	0.004	0.337
Coverage	18.9	17.0	10.1
NumIssuer	15.6	12.0	13.7
Convergence	0.072	0.133	0.509
DaysElapsed	9.4	5.0	13.4
ForHorizon	88.3	71.0	42.6
Panel C: Raw Value of Analyst Characteristics			
General Experience (# Qtrs.)	7.3	6.0	4.7
Firm Experience (# Qtrs.)	4.1	3.0	3.5
Lag Forecast Accuracy	0.6	0.0	77.9
Brokerage Size (# Analysts)	60.7	43.0	59.6
Forecast Frequency	4.3	4.0	2.0
Number of firms covered	20.1	17.0	16.4

Panel C reports the raw (unscaled) values of various analyst characteristics. The average (median) analyst has 7.3 (6.0) quarters of career experience as an analyst, with 4.1 (3.0) quarters

following firm *i* as of year *t*. *LagForecastAccuracy* reports a mean (median) of 0.6 (0.0) for the difference between the maximum absolute forecast error and the forecast error of analyst *i*. On average (median), firms employ 60.7 (43.0) analysts, with analysts making, on average, 4.3 (4.0) forecasts per year. Analysts cover, on average (median), 20.1 (17.0) firms in a given year.

Table 3 examines the effect of information shock on boldness or herding in analyst forecasts. Logistic regression results for equation (1) for the two measures of boldness are reported. Results in Table 3 are reported for the sample as a whole and for the two subsamples based on the sign of the mean consensus revision. If there is a positive (negative) change in mean consensus forecast immediately before an analyst's forecast revision, the analyst's forecast revision is assigned to the 'upward (downward) consensus revision' group. A positive (negative) mean consensus change is classified as good (bad) news. For ease of interpretation, we use the absolute value of the change in consensus (*AbsChgCon*) and the deviation of current forecast from prior consensus (*AbsDeviation*).

Results for equation (1) presented in Table 3 show that for the whole sample and for both subsamples the probability of a bold forecast revision defined as *Bold1* or *Bold2* is significantly greater with larger changes in the mean consensus forecast (*AbsChgCon*). Put another way, *AbsChgCon* represents the magnitude of new information observed by an analyst, and *Bold1* indicates that the analyst's revised forecast is more optimistic (pessimistic) than her current outstanding forecast and optimistic (pessimistic) relative to the mean consensus. Therefore, the positive coefficient on *AbsChgCon* suggests that the analyst becomes more optimistic (pessimistic) when she observes a large magnitude of new information. Similarly, the deviation of the analyst's forecast from the consensus forecast increases with a large magnitude of new information.

For the whole sample and both subsamples, Table 3 shows that analysts are significantly less likely to issue bold forecasts (more likely to herd) when their current earnings forecasts are further away from prior consensus forecast (*AbsDeviation*). This result is consistent with the idea that analysts are under pressure to conform when their forecasts deviate substantially from the mean consensus forecast.

Table 3 shows mixed results for the *lnCoverage* variable. Prior research suggests that greater competition among analysts results in greater generation of private information by analysts (Jeffery S. Abarbanell, et al., 1995; Lang & Lundholm, 1996). Table 3 shows the probability of bold forecasts is greater for *Bold1* (whole sample and both subsamples) with higher analyst coverage. On the other hand, bold is negatively related to *lnCoverage* using *Bold2* (whole sample and downward consensus subsample), although the estimated coefficient is not significantly different from zero for the upward consensus subsample. A possible explanation for these mixed results is that more private information does not consistently lead to bold forecasts. In the aggregate, greater generation of private information by analysts could lead to more accurate consensus forecasts, which could lead to fewer bold forecasts.

Table 3				
	Bold1		*Bold2*	
Parameter	Estimate	p-value	Estimate	p-value
Panel A: All Revisions				
Intercept	0.6068	0.0001	0.0761	0.0302
AbsChgCon	0.3923	0.0001	1.0552	0.0001
AbsDeviation	-0.6938	0.0001	-4.7139	0.0001
lnCoverage	0.1100	0.0001	-0.0336	0.0001
DaysElapsed	0.0031	0.0001	0.0033	0.0001
ForHorizon	0.0005	0.0001	0.0025	0.0001
N	213,539		213,539	
Pseudo R-sq.	0.0066		0.0505	
Panel B: Upward Consensus Revisions				
Intercept	0.3574	0.0001	-0.0522	0.3551
AbsChgCon	0.4349	0.0001	0.8485	0.0001
AbsDeviation	-0.8015	0.0001	-4.1841	0.0001
lnCoverage	0.1467	0.0001	-0.0164	0.1826
DaysElapsed	0.0044	0.0001	0.0040	0.0001
ForHorizon	0.0003	0.1096	0.0018	0.0001
N	102,433		102,433	
Pseudo R-sq.	0.0194		0.0607	
Panel C: Downward Consensus Revisions				
Intercept	0.7795	0.0001	0.1134	0.0132
AbsChgCon	0.3222	0.0001	1.0535	0.0001
AbsDeviation	-0.6205	0.0001	-4.7435	0.0001
lnCoverage	0.0714	0.0001	-0.0446	0.0001
DaysElapsed	0.0020	0.0005	0.0028	0.0001
ForHorizon	0.0008	0.0001	0.0031	0.0001
N	111,613		111,613	
Pseudo R-sq.	0.0033		0.0483	

The control variables *DaysElapsed* and *ForHorizon* have positive coefficients that are almost all significantly different from zero for regressions reported in Table 3. The one exception is ForHorizon for the upward consensus subsample. These results suggest that a bold forecast is more likely when a longer time has elapsed since the previous analyst forecast for a firm. In addition, the longer the forecast horizon (time until year-end), the more likely a forecast is bold.

Empirical results in Table 3 confirm Bikhchandani and Sharma's (2001) prediction that herding is sensitive to information shock. We find analysts are more likely to issue bold forecasts when there is a large change in market expectations. In addition, analysts are more likely to move toward the consensus forecast when their current outstanding forecast deviates more from the consensus forecast. Our results also support the prediction by Scharfstein and Stein (1990) that analysts are subject to market pressure when their forecasts are inconsistent with the consensus forecast.

Table 4 reports the results of estimating equation (2), which includes an *Optimism* or *Pessimism* dummy variable and the interactive variable (*AbsChgCon* × *Optimism* or *AbsChgCon* × *Pessimism*). Equation (2) tests whether the probability of bold forecasts differs based on whether analysts' current outstanding forecasts are optimistic relative to the consensus forecast.

Results for *AbsChgCon* are similar to those reported in Table 3. The probability of a bold forecast revision, defined as *Bold1* or *Bold2,* is significantly greater with larger changes in the mean consensus forecast (*AbsChgCon*). The effect of analysts' optimistic (pessimistic) current forecast on the probability of bold forecasts differs with measure of boldness. In the case of *Bold1,* negative coefficients on *Optimism (Pessimism)* and *AbsChgCon* × *Optimism (Pessimism)* suggest that when analysts whose current forecasts are optimistic (pessimistic) observe downward (upward) consensus revisions, they are more likely to converge to consensus forecasts. The coefficients are negative for both upward and downward consensus revision subsamples. In other words, when analysts observe new information different from their own information, they are more likely to converge to consensus forecast. Stated another way, analysts are less likely to issue bold forecasts (defined as *Bold1*) in the face of new information that differs from their own information. On the other hand, for *Bold2*, those coefficients are positive.

Note that *Bold1* defines a forecast as bold if it is greater (less) than the analyst's own prior forecast and greater (less) than the current consensus forecast, whereas *Bold2* defines a forecast as bold only if the deviation of the analyst's forecast from the consensus forecast *increases* relative to that of the analyst's prior forecast. Considering the definitions of bold along with our results suggests that analysts who observe the consensus forecast moving away from their current forecasts are more likely to converge toward the consensus forecast, but they do not converge to consensus forecasts as much as prior forecast. This means that analysts maintain their optimistic (pessimistic) positions even though they observes the new information that differs from their prior information.

Table 4				
	Bold1		*Bold2*	
Parameter	Estimate	p-value	Estimate	p-value
Panel A: All Revisions				
Intercept	0.5833	<.0001	0.0645	0.0684
AbsChgCon	0.7134	<.0001	0.9241	<.0001
AbsDeviation	-0.7128	<.0001	-4.6758	<.0001
OptimisticFct	0.0549	<.0001	0.0304	0.0033
AbsChgCon × Optimism	-0.8898	<.0001	0.3527	<.0001
lnCoverage	0.1097	<.0001	-0.0339	<.0001
DaysElapsed	0.0031	<.0001	0.0033	<.0001
ForHorizon	0.0005	<.0001	0.0024	<.0001
N	213,539		213,539	
Pseudo R-sq.	0.0077		0.0507	
Panel B: Upward Consensus Revisions with Pessimism Dummy Variable				
Intercept	0.7867	<.0001	-0.1381	0.0155
AbsChgCon	0.2265	0.0010	0.3274	0.0001
AbsDeviation	-0.8162	<.0001	-4.1272	<.0001
Pessimism	-0.9573	<.0001	0.1447	<.0001
AbsChgCon × Pessimism	-0.8889	<.0001	2.8393	<.0001
lnCoverage	0.1413	<.0001	-0.0127	0.3054
DaysElapsed	0.0042	<.0001	0.0043	<.0001
ForHorizon	0.0005	0.0026	0.0017	<.0001
N	96,875		96,875	
Pseudo R-sq.	0.0473		0.0402	
Panel C: Downward Consensus Revisions with Optimism Dummy Variable				
Intercept	1.0832	<.0001	-0.0093	0.8402
AbsChgCon	0.3229	<.0001	0.7792	<.0001
AbsDeviation	-0.7310	<.0001	-4.4483	<.0001
Optimism	-0.8282	<.0001	0.3124	<.0001
AbsChgCon × Optimism	-0.7827	<.0001	1.1719	<.0001
lnCoverage	0.0672	<.0001	-0.0401	0.0005
DaysElapsed	0.0016	0.0075	0.0030	<.0001
ForHorizon	0.0013	<.0001	0.0029	<.0001
N	117,171		117,171	
Pseudo R-sq.	0.0357		0.0697	

Results for *AbsDeviation* are also similar to those reported in Table 3. Bold forecasts are less likely (herding more likely) with greater deviation of an analyst's current forecast from the day prior consensus forecast. This result is consistent with results in Table 3 that suggest market pressure to conform exists for analysts who deviate from consensus. Finally, we examine the results in Table 4 for *lnCoverage*, *DaysElapsed*, and *ForHorizon,* which are similar to those reported in Table 3. The *lnCoverage* variable has positive coefficients with Bold1 and negative coefficients with Bold2. These results suggest that, in the aggregate, greater generation of private information by analysts could lead to more accurate consensus forecasts, which could result in individual forecasts that deviate less from the consensus forecast. As in Table 3, *DaysElapsed* and *ForHorizon* have positive coefficients that are significantly different from zero for all regressions reported in Table 4. Thus bold forecasts are more likely when a longer time has elapsed since the previous analyst forecast for a firm and when the forecast horizon is longer.

Table 5 reports the results of estimating equation (3), which tests whether the impact of the change in the consensus is affected by the underlying strength of opinion among the analysts. Recall that equation (3) includes two additional interactive variables, *AbsChgCon* ×*Convergence* and *AbsChgCon* ×*NumIssuer*. *Convergence* is calculated as the change in the standard deviation of the forecasts used in computing the consensus forecast. Thus larger values of *Convergence* indicate greater uniformity of opinion among the analysts and greater strength in the consensus forecast. For *NumIssuer*, the number of analysts is an indication of the strength of the consensus forecast since a consensus forecast based on a small number of analysts would have less strength than the same consensus forecast backed by a large number of analysts.

As expected, results show that the probability of a bold forecast is lower with strong information. The negative coefficients of *AbsChgCon* × *Convergence* indicate that when there is a large magnitude change in the consensus in conjunction with lower dispersion of analyst forecasts, there is a lower probability of bold forecasts. The coefficients of *AbsChgCon* × *NumIssuer* are negative for all regressions in Table 5, indicating that the probability of a bold forecast is lower when a large magnitude change in consensus is based on a large number of analyst forecasts.

Equation (4) examines the variables in equation (3), but also controls for several analyst characteristics. Results, which are reported in Table 6, are consistent with those reported in Table 5. Thus, our results are robust to inclusion of variables representing individual analyst ability, implying that prior information is an additional determinant of herding.

Table 5				
	Bold1		*Bold2*	
Parameter	Estimate	p-value	Estimate	p-value
Panel A: All Revisions				
Intercept	0.4752	<.0001	-0.1638	<.0001
AbsChgCon	1.8784	<.0001	4.0342	<.0001
AbsDeviation	-0.7765	<.0001	-4.8139	<.0001
Optimism	0.0544	<.0001	0.0102	0.3377
AbsChgCon × Optimism	-0.9246	<.0001	0.5433	<.0001
AbsChgCon ×Convergence	-0.5844	<.0001	-1.6739	<.0001
AbsChgCon × NumIssuer	-0.3786	<.0001	-1.1223	<.0001
lnCoverage	0.1490	<.0001	0.0514	<.0001
DaysElapsed	0.0030	<.0001	0.0036	<.0001
ForHorizon	0.0005	0.0001	0.0023	<.0001
N	206,392		206,392	
Psuedo R-sq.	0.0093		0.0565	
Panel B: Upward Consensus Revisions with Pessimism Dummy Variable				
Intercept	0.7193	<.0001	-0.2977	<.0001
AbsChgCon	1.7359	<.0001	3.8705	<.0001
AbsDeviation	-0.8957	<.0001	-4.1893	<.0001
Pessimism	-0.9523	<.0001	0.1338	<.0001
AbsChgCon × Pessimism	-1.0248	<.0001	3.1402	<.0001
AbsChgCon ×Convergence	-0.9189	<.0001	-2.1553	<.0001
AbsChgCon × NumIssuer	-0.4606	<.0001	-1.2773	<.0001
lnCoverage	0.1660	<.0001	0.0481	0.0004
DaysElapsed	0.0041	<.0001	0.0046	<.0001
ForHorizon	0.0006	0.0013	0.0016	<.0001
N	93,445		93,445	
Psuedo R-sq.	0.0488		0.0442	
Panel C: Downward Consensus Revisions with Optimism Dummy Variable				
Intercept	0.9463	<.0001	-0.2957	<.0001
AbsChgCon	1.4803	<.0001	3.8676	<.0001
AbsDeviation	-0.7995	<.0001	-4.6498	<.0001
Optimism	-0.8352	<.0001	0.2645	<.0001

Table 5				
	Bold1		*Bold2*	
Parameter	Estimate	p-value	Estimate	p-value
AbsChgCon × Optimism	-0.8943	<.0001	1.4061	<.0001
AbsChgCon ×Convergence	-0.5710	<.0001	-1.5399	<.0001
AbsChgCon × NumIssuer	-0.3739	<.0001	-1.1166	<.0001
lnCoverage	0.1188	<.0001	0.0702	<.0001
DaysElapsed	0.0015	0.0150	0.0031	<.0001
ForHorizon	0.0011	<.0001	0.0027	<.0001
N	113,445		113,445	
Psuedo R-sq.	0.0385		0.0766	

Table 6				
	Bold1		*Bold2*	
Parameter	Estimate	p-value	Parameter	Estimate
Panel A: All Revisions				
Intercept	0.0822	0.0829	-0.2858	<.0001
AbsChgCon	1.7792	<.0001	3.9598	<.0001
AbsDeviation	-0.7914	<.0001	-4.8375	<.0001
Optimism	0.0564	<.0001	0.0108	0.3071
AbsChgCon × Optimism	-0.9005	<.0001	0.5465	<.0001
AbsChgCon × Convergence	-0.5828	<.0001	-1.6683	<.0001
AbsChgCon ×NumIssuer	-0.3372	<.0001	-1.0847	<.0001
Coverage	0.1736	<.0001	0.0687	<.0001
DaysElapsed	0.0026	<.0001	0.0034	<.0001
ForHorizon	0.0007	<.0001	0.0024	<.0001
GeneralExperience	-0.0164	0.3676	-0.0375	0.0269
FirmExperience	0.1065	<.0001	0.0258	0.1239
LagForAccuracy	0.1299	<.0001	-0.0316	0.0460
BrokerageSize	0.3677	<.0001	0.0816	<.0001
Frequency	0.1219	<.0001	0.0994	<.0001
FirmCoverage	-0.0913	<.0001	0.0229	0.1747
N	206,392		206,392	
Psuedo R-sq.	0.0120		0.0568	

Table 6				
	Bold1		*Bold2*	
Parameter	Estimate	p-value	Parameter	Estimate
Panel B: Upward Consensus Revisions with Pessimism Dummy Variable				
Intercept	0.3339	<.0001	-0.4484	<.0001
AbsChgCon	1.6075	<.0001	3.7009	<.0001
AbsDeviation	-0.9054	<.0001	-4.2141	<.0001
Pessimism	-0.9445	<.0001	0.1360	<.0001
AbsChgCon × Pessimism	-0.9746	<.0001	3.1673	<.0001
AbsChgCon × Convergence	-0.9110	<.0001	-2.1472	<.0001
AbsChgCon ×NumIssuer	-0.4050	<.0001	-1.1928	<.0001
Coverage	0.1963	<.0001	0.0687	<.0001
DaysElapsed	0.0038	<.0001	0.0043	<.0001
ForHorizon	0.0008	<.0001	0.0019	<.0001
GeneralExperience	-0.0543	0.0495	-0.0792	0.0015
FirmExperience	0.1170	<.0001	0.0165	0.5021
LagForAccuracy	0.1089	<.0001	-0.0252	0.2858
BrokerageSize	0.2986	<.0001	0.0930	<.0001
Frequency	0.1316	<.0001	0.1652	<.0001
FirmCoverage	-0.0380	0.1652	0.0151	0.5434
N	93,445		93,445	
Psuedo R-sq.	0.0506		0.0448	
Panel C: Downward Consensus Revisions with Optimism Dummy Variable				
Intercept	0.6682	<.0001	-0.4640	<.0001
AbsChgCon	1.4324	<.0001	3.8131	<.0001
AbsDeviation	-0.8089	<.0001	-4.6754	<.0001
Optimism	-0.8218	<.0001	0.2710	<.0001
AbsChgCon × Optimism	-0.8678	<.0001	1.4133	<.0001
AbsChgCon × Convergence	-0.5686	<.0001	-1.5356	<.0001
AbsChgCon ×NumIssuer	-0.3536	<.0001	-1.0880	<.0001
Coverage	0.1364	<.0001	0.0877	<.0001
DaysElapsed	0.0013	0.0291	0.0030	<.0001
ForHorizon	0.0013	<.0001	0.0028	<.0001
GeneralExperience	0.0193	0.4412	-0.0067	0.7737

Table 6				
	Bold1		*Bold2*	
Parameter	Estimate	p-value	Parameter	Estimate
FirmExperience	0.0782	0.0018	0.0463	0.0456
LagForAccuracy	0.0786	0.0007	-0.0061	0.7780
BrokerageSize	0.2846	<.0001	0.1282	<.0001
Frequency	0.0563	0.0320	0.0727	0.0028
FirmCoverage	-0.0767	0.0019	0.0088	0.7017
N	113,445		113,445	
Psuedo R-sq.	0.0400		0.0769	

With respect to analyst characteristics, results for *GeneralExperience* are mixed. For the whole sample (*Bold2*) and the upward consensus subsample (both *Bold1* and *Bold2*), analysts with more general experience are less likely to make bold forecasts. For the remaining three cases (*Bold1* whole sample and downward consensus subsample, and *Bold2* downward consensus subsample) the coefficients are not significantly different from zero. *FirmExperience* is generally positively and significantly related to bold forecasts, suggesting that analysts with greater firm expertise are more likely to make bold forecasts. But for *Bold2* (whole sample and upward consensus subsample), the coefficients are positive but not significantly different from zero.

Larger values of *LagForAccuracy* represent more accurate prior forecasts. Table 6 shows that results for *LagForAccuracy* are mixed. *Bold1* (whole sample and both subsamples) has significant positive coefficients for *LagForAccuracy, suggesting that analysts who have a history of accurate forecasts are more likely to issue bold forecasts.* However, results show that for *Bold2* (whole sample), *LagForAccuracy* is negatively related to bold forecasts. *Bold2* coefficients for *LagForAccuracy* for both subsamples are not significantly different from zero. Considering the definition of Bold2, these results fail to show that analysts with a history of accuracy are more likely to issue forecasts that deviate more from consensus relative to their prior forecasts.

Results in Table 6 for *BrokerageSize* are stronger, with evidence showing that for all regressions, analysts with larger brokerage firms are more likely to make bold forecasts. Similarly, all regressions show that the probability of bold forecasts is greater (herding is less likely) for analysts who make more frequent forecasts for a firm. The relation between bold forecasts and *FirmCoverage* is limited. Results show that for *Bold1* (whole sample and downward consensus subsample), firms with greater coverage have a lower probability of bold forecasts. However, for *Bold1* (upward consensus subsample) and *Bold2* (all regressions), there is not a statistically significant relation between the bold variable and *FirmCoverage.*

SUMMARY AND CONCLUSION

This paper investigates how prior information affects analyst herding decisions. We use two measures of bold analyst behavior and forecasts to examine analyst herding behavior. Our analysis provides several key results. First, our results suggest the probability of a bold (herding) forecast revision is greater (smaller) with large information shocks. Second, analysts are more likely to herd in their forecast revisions when their current outstanding forecasts deviate more from the consensus mean. This result suggests that analysts yield to market pressure to conform. Additionally, analysts are more likely to herd in their forecast revisions in the presence of strong observable signals (large information shocks in conjunction with either convergence in analyst forecasts or a large number of analyst forecasts). Results also show that, in general, analysts with current outstanding forecasts that are optimistic are more likely to issue revised forecasts that are also optimistic. However, results vary under specific conditions such as upward or downward consensus revisions. Overall, this research adds to the existing body of evidence on analyst herding behavior. Our findings can help market participants better evaluate earnings forecasts by considering the conditions under which analysts are more likely to herd.

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