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Table of Contents

Social Security Retirement Income Program: Reform vs. Privatize

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Abstract

This paper compares recommended reforms to improve the Social Security retirement income program to the expected benefits of privatizing it. The research method is primarily theoretical, applying fundamental principles of finance and economics to analyze and evaluate each alternative. However, enough empirical data is also provided to test the author's arguments and conclusions. The most important conclusion is that partial privatization would be better than the other recommended reforms, but a fully-funded and totally privatized program would be best, financially and economically for society. However, given government policymakers' lack of political will to privatize the program, it's most likely that they will continue to reform it in ways to make it more financially sustainable. The paper primarily adds to the existing literature by providing a strong theoretical and empirical argument for privatizing the Social Security retirement income program, rather than continuing to reform it.

I. Introduction

This paper explores whether it's better to continue to reform the Social Security retirement income program or privatize it. That's an important research question for most U.S. workers and their employers who help pay the FICA (Federal Insurance Contribution Act) taxes to finance the projected retirement benefits. Most Americans either currently receive or expect to receive monthly retirement income checks from the Social Security Administration during their retirement years.

The author of this paper believes he has a comparative advantage in researching this topic, as a financial economist experienced in teaching both public finance and personal financial planning, and being old enough to file for Social Security retirement income benefits. This is a research topic that the author has explored for several decades. Even though this paper analyzes, evaluates, and recommends changes in this important government program, the author is not politically motivated, and doesn't believe his research is politically biased. The author highly values his academic integrity. The author recognizes that any recommended changes in this important government program will be controversial and worthy of additional research and honest debate. Currently, neither the Democratic Party nor the Republican Party favors either partial privatization or complete privatization of this important government program.

The author uses fundamental principles of finance and economics to analyze and evaluate recommended reforms, partial privatization, and total privatization of the Social Security retirement income program. Research data is presented which provides empirical support for the theoretical arguments and conclusions. The paper also introduces political considerations, which are important to the government policymakers who have to make these public finance decisions. In campaigning for their political office, most candidates have pledged to "save" Social Security, which means they won't privatize it. A widely-held view is that voting to cut Social Security benefits would be the third rail of politics -- the end of your political career.

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Private sector failure, as evidenced by the fact that many people have not saved enough to keep themselves out of poverty throughout their projected retirement years, justifies some government policy efforts to improve market conditions. However, public sector financial assistance, in the form of supplementing households' retirement income, creates the moral hazard problem of increased private sector dependence on public assistance. The more the government promises to provide in retirement income, the less individuals save during their working years for their own retirement. As the government taxes away workers' income to save for their retirement, it crowds out their saving for retirement in the private sector. Compared to other developed OECD (Organization for Economic Co-operation and Development) countries, U.S. households' saving rate out of disposable personal income is relatively low (Feldstein, 2008). Most Americans are not saving enough to finance their pre-retirement lifestyle during 20-30 years of retirement, without receiving Social Security retirement income.

To be economically efficient, market participants need to be rational, self-interested, and forward-looking. To be forward-looking, our Social Security retirement income program needs to be financially sustainable for future generations. Currently, it's a pay-as-you-go system that is not fully funded and not financially sustainable. Consequently, there is substantial political risk that retirees' could have their Social Security retirement income benefits cut prior to their retirement or during their retirement years. There is also significant risk that FICA taxes will be increased in the future on employees and employers. Government policymakers will also most likely increase the percentage of Social Security retirement income that is taxed, in an ongoing effort to raise enough tax revenue to make the program financially sustainable.

The Social Security Trust Funds are totally invested in U.S. government bonds; so future payments are dependent on the government's ability to pay its debt obligations. However, the U.S. government budget has a large budget deficit of about $1 trillion in 2012 and a national debt of about $15 trillion, approximately equal to the U.S. gross domestic product (GDP). The U.S. government is currently forecasting that its national debt will increase by about $8 trillion over the next ten years, growing faster than the U.S. economic growth rate, thereby increasing the U.S. government's debt/GDP ratio, and increasing its default risk (Riley, 2012). Its credit rating was downgraded in 2011, with a negative outlook. Future credit downgrades would most likely increase the interest rate cost of financing its national debt.

The failure of government intervention to achieve its economic and financial goals demonstrates public sector failure. Although the Social Security retirement income program provides valuable benefits to retirees, the program in its current form is not financially sustainable. While making the reforms recommended by this paper would improve it, this paper argues that it would be better to partially privatize it, and best to fully-fund and totally privatize it.

The next section of the paper provides a review of the literature, followed by recommended reforms, including partial privatization. The subsequent subtopic highlights the expected benefits of total privatization, followed by the author's conclusions, and references of researched sources.

II. Literature Review

Limiting the government to laissez-faire policies in a competitive market economy is best, in the absence of substantial market failure. Laissez-faire policies authorize the government to do what it does better than private sector market participants. Redistribution of income and wealth is not a laissez-faire policy. Competitive markets are best at distributing most resources, products, income, and wealth to meet the needs and wants of most households and businesses. In principle, a competitive market economy is largely self-regulating, operating without the need of substantial government regulation, in the absence of substantial market failure (Johnston, 1988; Friedman & Friedman, 1980). These fundamental economic principles suggest that it would be better for most Americans to voluntarily save and invest for their own retirement and manage their own retirement income cash flows than to have the U.S. government force them to save for retirement by paying FICA taxes, then have the government invest their money in government bonds, to provide them a single life annuity retirement income, based on the government bureaucracy's management of the collectively pooled and redistributed Social Security funds.

On the other hand, private sector failure justifies some public sector intervention to improve market conditions to maximize social welfare – the economic well-being of most market participants (Congleton & Bose, 2010). While having a Social Security retirement income program is not economically ideal or optimal; the law of second best suggests that when the market conditions don't meet the requirements for achieving the best solution, the second best solution should be used, but the second best solution could be quite different from the best solution (Bosetti & Victor, 2011). Currently, the high dependence of the elderly on Social Security retirement income suggests that it should be continued to reduce poverty among the elderly, as a second best solution, because many retirees have not accumulated a large enough nest egg to finance their retirement years independent of this government program, despite their opportunity to contribute to a variety of tax-sheltered retirement accounts, including 401(K) accounts and Individual Retirement Accounts (IRA). Most future retirees will not have a defined benefit pension funded throughout their lifetime of work for a single employer to help finance their retirement. The Social Security retirement income program was started by the Social Security Act of 1935. Today, Social Security is the largest source of retirement income for the average American. It is expected to provide between 40% and 60% of pre-retirement income for most individuals who worked until their full retirement. It is not expected to provide all the retirement income needed by most retirees (Gitman & Joehnk, 2005).

However, public sector intervention is typically accompanied by public sector failure, as explained by public choice theory (Couch, Burton, Malone, & Black, 2011). Government policy attempts to improve market conditions often fail to achieve their policy goals. While businesses and individuals in the private sector sometimes fail to do what's best economically and financially for themselves and society; government policy attempts to fix the problems are often inefficient and unfair. Consequently, some market failure usually persists, despite government intervention. Some failed government attempts to improve market conditions could worsen them. The Social Security retirement income program demonstrates public sector failure to improve on private market conditions, because it would be more efficient and fair for each individual to manage their own finances, including their retirement savings, investments, and distributions. In principle, the decentralized decision making by millions of individuals with the

help of their professional financial advisers, to achieve their individual retirement goals is better than the centralized decision making of the U.S. government, even when it is trying to do what the government believes is best for most individuals.

In 1983, during the Reagan Administration, the Greenspan Commission recommended over 20 changes to the Social Security's retirement income (i.e., old age) program. The recommended reforms included, a gradual increase in the full retirement age, a small increase in the FICA tax rate for both employees and employers, taxing the Social Security retirement income of higher-income households, an increase in the credit for each year a retiree delayed filing for SS benefits from 3% to 8%, a change in the calculation of inflation-adjustments to retirement income benefits, removing the Social Security Trust Funds from the unified budget, and making the Social Security Administration an independent agency of the U.S. government (Greenspan Commission, 1983; Blahous, 2010).

During the Clinton Administration, the 1994-'96 Advisory Council Report recommended three alternative reforms of the Social Security retirement income program (1996). The first was called a maintenance of benefits (MB) plan; it raised taxed revenue, as needed to maintain the program's financial solvency. Some of the funds could be invested in common stocks indexed to the broad market, to increase the portfolio return at a manageable level of portfolio risk. The second was called an individual accounts plan (IA), with an additional FICA tax to finance the supplemental account. These funds could be allocated to a limited range of government approved investments. Retirement income would be paid out as a life annuity. The full retirement age would be gradually increased. Social Security benefits would be reduced for middle-income and high-income retirees. The third was called a personal security accounts (PSA) plan, funded by about one-third of FICA tax revenue. Each individual PSA account owner could invest their funds privately, as desired, including equity investments, and have a variety of payout options in retirement. These funds would not need to be paid out as a single life annuity. The age at which retirees could first collect monthly retirement income payments would be gradually increased from 62 to 65. The modified retirement benefit would be reduced, and reduced more for some retirees, including dependent spouses. Taxes on retirement benefits would be increased.

In 2001, President Bush formed a commission to recommend reforms to the Social Security programs. "The Commission was asked to make recommendations to modernize and restore fiscal soundness to Social Security, using six guiding principles (2001 President's Reform Commission):

1. Modernization must not change Social Security benefits for retirees or near-retirees.
2. The entire Social Security surplus must be dedicated only to Social Security.
3. Social Security payroll taxes must not be increased.
4. The government must not invest Social Security funds in the stock market.
5. Modernization must preserve Social Security`s disability and survivors insurance programs.
6. Modernization must include individually controlled, voluntary personal retirement accounts, which will augment Social Security."

The first paragraph of the executive summary of the commission's reports highlights some of the most important expected benefits of having voluntary personal accounts in the Social Security retirement income program.

> "Social Security will be strengthened if modernized to include a system of voluntary personal accounts. Personal accounts improve retirement security by facilitating wealth creation and providing participants with assets that they own and that can be inherited, rather than providing only claims to benefits that remain subject to political negotiation. By allowing investment choice, individuals would be free to pursue higher expected rates of return on their Social Security contributions. Furthermore, strengthening Social Security through personal accounts can add valuable protections for widows, divorced persons, low-income households and other Americans at risk of poverty in old age (Report of the President's Commission to Strengthen Social Security, 2001)."

The independent accounts and individual personal security accounts recommended by President Clinton's commission and the voluntary personal retirement accounts recommended by President Bush's commission represent partial privatization. However, neither of these recommendations has become part of the Social Security retirement income program to date.

One possible concern with the recommendations of these presidential commissions is that they could be politically biased in favor of the President who appointed them. However, the author of this paper doesn't find any clear evidence of that. Many of their recommended reforms of the Social Security retirement income program are similar for commissions appointed by both Democratic and Republican Presidents. Most of their recommendations have not been implemented by the government.

> "In the 2009 Annual Report to Congress, the Trustees announced:
> - The projected point at which tax revenues will fall below program costs comes in 2016 -- one year sooner than the estimate in last year's report.
> - The projected point at which the Trust Funds will be exhausted comes in 2037 -- four years sooner than the estimate in last year's report.
> - The projected actuarial deficit over the 75-year long-range period is 2.00 percent of taxable payroll -- up from 1.70 percent in last year's report.
> - Over the 75-year period, the Trust Funds would require additional revenue equivalent to $5.3 trillion in today's dollars to pay all scheduled benefits (Lassiter, 2009)."

The 2009 annual report of the Social Security Trustees is the last report published on the Social Security Administration's website. One wonders when these "annual" audit reports will be published for 2010 and 2011! The U.S. government requires public corporations to publish their annual reports each year, but it doesn't hold itself to the same financial reporting standard. The audit reports for recent years show that the Social Security retirement income trust fund will soon have an annual budget deficit and will be "exhausted" in about 25 years. Trillions of additional dollars would be needed to make the program financially sustainable for the next 75 years (Lassiter, 2009). In brief, this public pension fund is massively under-funded, despite many recommended reforms in recent decades. The U.S. government would not permit a large public company to under-fund its defined benefit pension fund by so much, but the government

doesn't hold itself to the same high financial management standards it requires of these private companies.

President Obama has promised to maintain current Social Security benefits for current and future generations of retirees. He favors continuing to invest Social Security trust funds in U.S. government bonds. He opposes proposals to privatize this government program (Obama, 2012).

Mitt Romney was the Republican candidate running against President Obama in the 2012 election for U.S. President. His campaign proposed only two changes to Social Security's retirement income program to make it financially sustainable for the projected future.

"Mitt's proposals will not raise taxes and will not affect today's seniors or those nearing retirement. He proposes that Social Security should be adjusted in a couple of commonsense ways that will put it on the path of solvency and ensure that it is preserved for future generations.

- First, for future generations of seniors, Mitt believes that the retirement age should be slowly increased to account for increases in longevity.
- Second, for future generations of seniors, Mitt believes that benefits should continue to grow but that the growth rate should be lower for those with higher incomes (Romney, 2012)."

III. Recommended Reforms to Achieve a Financially Sustainable Program

- Increase the Retirement Age: from 67 to 70, adjusted to changes in life expectancy. For anyone born in 1960 or later, the normal retirement age is 67, to receive full retirement income benefits. Reduced monthly income payments are available for those choosing to retire as early as age 62. A retired spouse could either claim benefits based on her or his own income or receive 50% of their husband's or wife's monthly benefit. A surviving retired spouse or one with dependent children could either continue to receive their own benefit or elect to receive the monthly retirement income of their deceased spouse, plus a lump-sum death benefit of several hundred dollars (Gitman & Joehnk, 2005).
- Increase the Tax Rate: FICA tax rate and/or the tax rate on benefits received. In 2010, an employee and employer each paid 7.65% of the employee's wage in FICA taxes, up to a maximum wage income; 1.45% of this was for Medicare (Your Social Security Statement, 2012). Workers who start collecting Social Security retirement income prior to their full retirement age will lose $1 in benefits for every $2 in earned income above the annual income limit ($11,520 in 2003), until they reach their full retirement age. Since 1984, 50% of Social Security retirement income is subject to federal income taxes for middle-income households; 85% is taxable for higher-income households (Gitman & Joehnk, 2005).
- Raise the cap on taxable income: The maximum wage income was $87,000 in 2003; this taxable wage base increases each year (Gitman & Joehnk, 2005). In 2011, wage income was taxable up to $106,800 (Your Social Security Statement, 2012).
- Invest in a Higher Risk & Higher Return Diversified Portfolio of Stocks, Bonds, and Money Market Assets: Just investing in U.S. Government bonds inefficiently provides

too low a return with too little risk, and creates a principal-agent, problem that could prove costly to future retiree principals (Philips & Muralidhar, 2008).

- Reduce the Projected Monthly Income Benefit, to Adjust to an Increasing Life Expectancy.
- Use a Lock Box for the Trust Fund of Tax Revenue and Investment Income: Separate the funds from the U.S. government's unified budget.
- Change from a Pay-as-you-go System to a Fully-Funded Pension System: Currently, there are no government assets to pay off maturing government bonds in the Social Security Trust Funds. The government did not invest the Social Security surplus of past decades in non-government assets it could sell to pay its financial obligations to retirees. That inefficient financial management is consistent with the public choice theory of public sector failure.

IV. Expected Benefits of Privatization

- No FICA Tax for Employees and Employers: There would be no forced retirement savings. Since individuals are rational, self-interested, and forward-looking, they vary their saving rate in different stages of their life, per the life cycle hypothesis of saving and consumption. If the combined employee and employer FICA tax on wage income were eliminated, most workers would be willing and able to increase their saving rate, thereby saving more for their future retirement.
- No Political Risk of Unexpected Tax Increases and Benefit Cuts: If not privatized, one possible reform is that benefits could be means-tested, cutting out benefits for higher income and wealthier retirees (Hogler & Hunt, 2010).
- No Entitlement Program Responsibility for High U.S. Government Budget Deficits and Debt: Entitlement programs, including Social Security programs, are now predicted to create a financially unsustainable trend increase in U.S. budget deficits and debt.
- No Redistribution of income and Wealth: There would be no more distributions to non-contributors (Kotlikoff, 2011). That would be an efficiency improvement, per the principle of fairness and per the benefits-received principle of taxation. A retiree's Social Security monthly retirement income benefit is based on his or her average annual income throughout their working age years. However, the benefit formula provides a higher benefit per dollar earned to lower-income retirees. Consequently, earning twice the average annual income won't double the monthly retirement income benefit from Social Security (Gitman & Joehnk, 2005).
- No Government Control over Retirees' Retirement Age, Contributions, and Withdrawals: Replacing government control over household finances with personal control would be an important efficiency improvement.
- A Larger Nest Egg and More Retirement Income (Johnston, 2011; Johnston, 2009): Investing individually, with the help of professional financial intermediaries, would enable investors to maximize returns within the risk tolerance of each investor, using an internationally diversified investment portfolio.
- A Larger Estate for Heirs (Johnston, 2011): Social Security only provides a single life annuity and only for those who survive to retirement age; its death benefit is insignificant and its survivor's benefit is only for a surviving spouse who still has dependent children. Privately managed retirement funds, including pension funds, have many payout options,

including options where some or all of the capital is preserved for a retiree's heirs. If privately managed, when a retirement investor dies before retiring, his or her funds are distributed to their designated beneficiaries.

- More Individual Freedom and Responsibility in a More Efficient and Fair Market Economy with Less Inefficient Government Intervention: That would be a better form of market Capitalism, with more of a laissez-faire government and a more competitive free market economy that is more self-regulating, which would benefit both retirees and society, per the invisible hand principle.

V. Conclusion

Compared to respected pension fund companies, such as Fidelity, Vanguard, Charles Schwab, TIAA-CREF, MassMutual, and many others, the U.S. government is a relatively poor financial manager of retirement funds. Rather than taking voluntary contributions, retirement funds are created by a forced saving plan, using FICA taxes, required by law. The government faces no competition for these funds, so it doesn't have to be competitive with private financial firms.

Rather than investing the funds in an internationally diversified portfolio to maximize the returns at a manageable level of risk for each contributor, the funds are entirely invested in U.S. government securities, which are low-risk and low-return assets. Since the government is both the only seller of its debt securities and also a buyer of them for the Social Security programs, it has an inherent conflict of interest, which could lower the future value of these investments; that demonstrates a principal-agent problem that could be costly to future retiree principals. Through its monetary policies, the U.S. government also controls the purchasing power of the U.S. dollar, in which its debt securities are denominated. Although projected benefits are indexed to inflation, the inflation index used to adjust Social Security benefits is not the same as the overall total consumer price index (CPI) measure that best measures the inflation rate borne by consumers.

Rather than keeping the funds in individual accounts, the funds are pooled and the retirement income benefits are designed to redistribute income to lower-wage households, to dependent spouses who haven't made tax contributions, and to survivors, thereby providing a negative return to the highest-wage workers.

Unlike distributions from private pension fund companies, the projected distribution of Social Security retirement income benefits is also exposed to substantial political risk, since the government could decide at any time to reduce the projected benefits to meet other political goals, such as the goal reducing the U.S. government's budget deficits and national debt.

Reforming the Social Security retirement income program will not fix these fundamental problems. Consequently, partially privatizing the Social Security retirement income program would be better than other recommended reforms, from an economic and financial perspective. Fully funding and entirely privatizing it would be best. However, what's best economically may not be best politically. In recent decades, those political leaders who have tried to partially privatize it have failed to get their recommendations implemented in law. Currently, neither

political party favors either partial privatization or complete privatization of this program. The government has not had the political will, courage, and fiscal discipline to do what is best economically and financially for society for the long-term projected future. Using a crisis management approach, government policymakers continue to kick the can down the road by incrementally reforming the Social Security retirement income program just enough to keep it alive, in the name of “saving Social Security”.

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Income Trusts in Canada: Value Loss from the Change in SIFT Taxation

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Abstract

This study investigates the market impact when Specified Investment Flow-Through (SIFT) trusts became liable to an entity tax, announced on October 31, 2006. After-tax valuation ratios indicate an initial after-tax loss of roughly 5% for Ontario taxpayers, which dropped to 3.5% when the legislation took effect in 2011. Tax integration is incomplete, as a 6.3% loss was moderated through beneficial treatment of the return of capital. Lastly, this study finds the after-tax loss for tax-exempt and foreign investors averages 25%, rather than the pre-tax charge of 31.5%. All investors were affected when income trusts were driven from the Canadian market.

I. Introduction

Income trusts were influential during their short tenure in the Canadian securities markets, but only real estate investment trusts (REITs) retained their tax-advantaged status post January, 2011. From less than 20 income trusts in 1996, the weighting in the domestic market surpassed 10% in 2006, when approximately 250 such issues were actively traded (Anderson, 2006). Early research from the Bank of Canada indicated concerns with the rapid rise of these securities (King, 2003). By 2004, their impact warranted a policy forum in which the rapid growth, tax consequences, and associated shortcomings were described (Aggarwal and Mintz, 2004; Edgar, 2004; Jog and Wang, 2004). These initial public offerings (IPOs) were the largest security issues in Canada during 2005 and 2006. Like all risky securities, there were good and poor performers in the sector but overall, the distributions provided relatively large, stable, income streams to unit-holders. Thus, trust units were popular in the low interest rate, bull market that followed the 2001 'dot-com' upheaval and preceded the 2008 market meltdown.

Investors were drawn to the high income yields derived from the beneficial tax structure and government efforts to reduce their advantage spawned several major tax policy changes. An initial attempt to level the playing field between income trusts and dividend-paying corporations involved a significant move towards tax integration in the May 2, 2006 budget, by focusing on the unequal tax treatment of dividends and interest payments. McKenzie (2006) reasoned that the trust structure still provided a tax benefit for tax-protected investors, foreign investors and others in the open market. Thus, demand for these securities continued, unabated until October 31, 2006, when the Finance Minister announced 'Tax Fairness' legislation that would impose a 31.5% tax levy, effective in 2011, on certain distributions by income trusts, redefined as Specified Investment Flow-Through (SIFT) trusts (Revenue Canada, 2006). Several studies have investigated the market response from a valuation perspective (Amoako-Adu and Smith, 2008; Glew and Johnson, 2011) and more recently, from a tax clientele perspective (Elayan et al., 2009; Edwards and Shevlin, 2011; Doidge and Dyck, 2011).

This paper extends understanding of the SIFT tax effect by considering the after-tax value loss suffered by domestic investors that paid taxes at low, middle, and high income levels and by comparing their losses to tax-exempt and foreign unit-holders. This approach improves the valuation ratio examined in the tax clientele literature (Edwards and Shevlin, 2011). By incorporating the cash payout designations, a more accurate model is provided and the study

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reveals practical concerns when discerning a clientele effect. The first analysis indicates a significant loss for Ontario personal taxpayers and defines the upper and lower valuation loss bounds in that jurisdiction. The second test indicates the average effect across all thirteen Canadian jurisdictions. The derived ratio demonstrates a lack of tax integration, without the potential for future improvement.

The results indicate that investors in income trusts in all tax brackets suffered a loss in portfolio value when the government levied the SIFT entity tax, in an effort to eliminate this type of security from the domestic market. Section II outlines the designation of income trust cash flows. A description of the methodology and data relating to the assessment follows in section III, with the presentation of main results in section IV. Section V concludes the study.

II. Description of Cash Payout/Distribution

The income trust investment vehicle was a tax planning innovation derived from the Canadian Income Tax Act (Act) rules as they pertained to trusts. Income trusts fell under the mutual fund trust designation prior to their reclassification, though generally the investment focused on a single underlying operation. The legislation allowed tax-free redistribution of various cash flows from capital assets through the unit trust, providing an affordable security to be offered to income-demanding investors. Sections 104-108, 122, and 132 of the Act describe the tax treatment afforded to distributions. Herein, the nature of the distributions is disclosed to explain the impact of the SIFT legislation that became Part IX.1, section 197, of the Act, which was announced on October 31, 2006, enacted on May 17, 2008, and became effective in January, 2011.

When announced, the aim of the legislation was reported as 'leveling the playing field' by treating income trusts in much the same manner as other tax paying corporations. The original description was left sufficiently vague, however, to allow flexibility in the tax rules that were to be later drafted. The Minister allowed that certain distributions would be subject to flow-through taxation at the applicable corporate rate in order to eliminate any tax advantage, with an intention to discourage the use of SIFT-equivalent structures going forward. The message has since been misinterpreted to suggest that tax integration was intended (Edwards & Shevlin, 2011). In fact, it was understood at the time that tax integration would not eliminate the tax advantage of trusts as the unit-holders resided in several tax brackets. Tax-exempt investors, in particular, had a greater advantage than those who paid personal tax in the year the distribution was received (McKenzie, 2006). Further, foreign investors might not receive a tax advantage per se, but they represented a significant source of tax leakage, as neither corporate nor personal tax is fully recovered domestically (Mintz, 2006). Thus the true aim of the legislative change was to arrange a system to recover at least as much tax from the income trusts as would be normally charged to corporations.

There were two direct effects of the enacted legislation: 1) SIFT organizations would be taxed on non-portfolio earnings at a predicted rate of 31.5% and 2) the resulting distributions would be treated as dividends, thereby receiving an effective tax credit. Non-portfolio earnings were defined in section 197(1) as income from business carried on by the trust in Canada, other than taxable dividends received, plus net capital gains less allowable capital losses. The entity

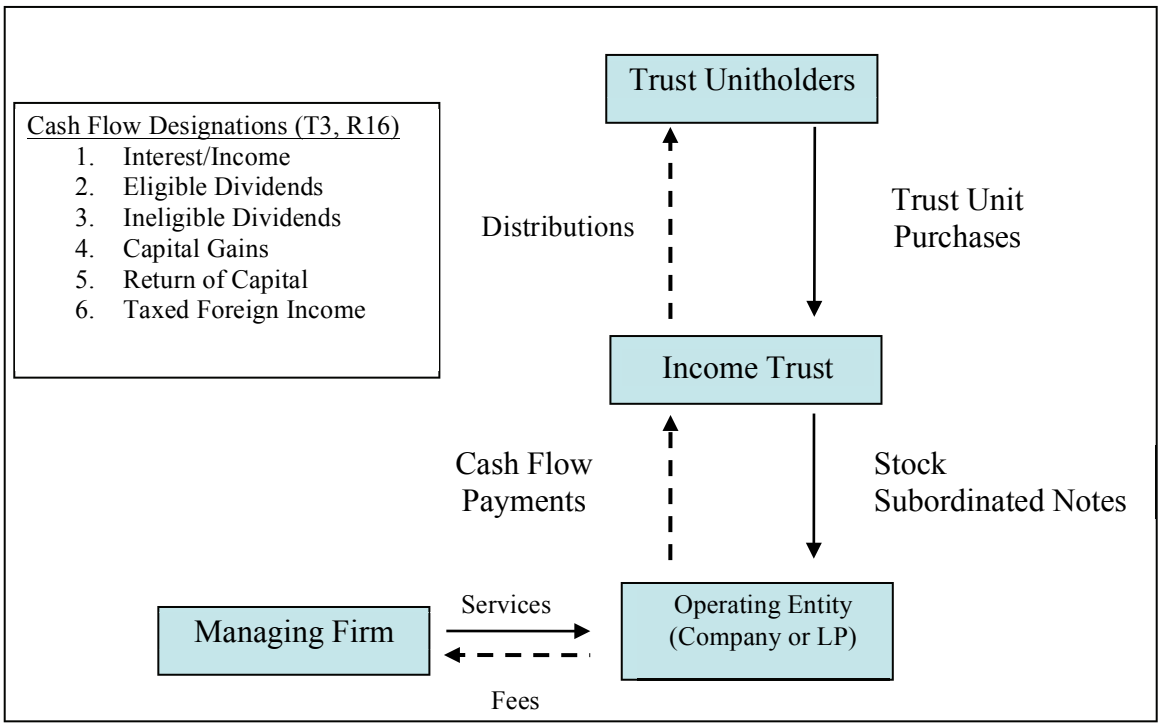
tax thus reduced the payout to all unit-holders. The reduction in pre-tax income had an immediate impact on the price of these securities in the market, providing an ideal situation for an event study in which to compare the two recent tax changes (Amoako-Adu and Smith, 2008). The drop corresponded to a rational market reaction to the loss of pre-tax payouts based on a discounted cash-flow valuation model (Glew and Johnson, 2011). The key to discerning the 2006 valuation result is recognition that the terminal value of the trust dropped in 2011, fifty months later, so the loss must be discounted.

More recently, the event was used to assess a tax clientele effect (Elayan et al., 2009; Edwards and Shevlin, 2011; Doidge and Dyck, 2011). All these researchers made convenient but inaccurate assumptions to carry their arguments forward, eliminating the some of the complexity required to understand the true effect of the tax change. Elayan et al. (2009) assume a fixed payout ratio of 100% (of earnings), treat the entire amount as interest used to reduce taxable earnings and suggest that the effect on all tax-paying investors is a slight drop in taxes paid, though no Canadian jurisdiction or tax bracket is referenced. Edwards and Shevlin (2011) begin with the premise that the Canadian tax system is integrated, so domestic taxpayers would not be affected 'after-tax' while tax-exempt and foreign investors would experience a 31.5% loss. This claim includes a tacit assumption that mimics that from the first paper (Elayan et al., 2009), since only the taxation of interest income and dividends were to approach integration following the tax change of May 2, 2006. Finally, Doidge and Dyck (2011) find an 18% effect after the second tax change but the authors neglect to compare this with a discounted value derived from the 31.5% loss in 2011. When discounting is included, their results compare closely to those reported earlier (Glew and Johnson, 2011). Their explanation of a prolonged market response proves more satisfactory. The shortcoming of the studies is the assumption that income trusts pay out only income in their distributions. Though this is the majority on average, consideration of the nature of the payout is necessary to eliminate a latent variable.

Income trusts are defined as unit trusts, in which capital assets in an underlying firm or partnership are held as the income generating property. There is variety in the organizational form chosen, but Figure 1 presents a typical depiction, with emphasis on the cash flows that are collected and dispersed by the trust. There are fifteen possible designations for cash that is routed through the trust, requiring annual reporting via the T3, R16, Statement of Trust Income Allocations and Designations tax form. Only six designations are commonly reported for income trusts: 1) interest/other income, 2) eligible dividends, 3) other dividends, 4) capital gains, 5) return of capital, and 6) foreign income (including the amount of foreign tax paid). Each amount has different tax history and thus deserves different tax treatment in the hands of the unit-holder.

On October 31, 2006, the Minister announced an entity level tax but did not release details of the legislative change. Some clarity was provided on November 6th and further explanations were then provided on December 22, 2012. While new tax legislation could have preserved the information provided in prior tax declarations, the enacted legislation only recognized the declared dividends as previously taxed payouts. Income from business carried on by the trust (non-portfolio earnings) would not be allowed as an expense to reduce taxes at the trust level. It would be taxed at the applicable corporate rate to replicate a dividend stream. The legislation decreased the value of the income trust distributions in the hands of all unit-holders, regardless of their tax status.

Figure 1
Typical Income Trust Structure highlighting Common Cash Flows



The SIFT amendment in Part IX.1 of the Act can be summarized as follows:

1. Interest income is taxed at the SIFT level and then treated as a dividend from the perspective of the SIFT, resulting in full taxation if the tax system integration is complete;

2. Designated dividends are unaffected, based on the definition of non-portfolio earnings;

3. Capital gains are included in non-portfolio earnings. Thus gains have been taxed at the corporate rate in the underlying firm and now are doubly taxed;

4. Foreign income is not referenced but may be further taxed; and

5. Return of capital is unaffected, retaining the benefit of deferral until the trust unit is sold.

Domestic investors subject to tax received reduced after-tax cash flows from interest income converted to dividend amounts and from capital gains that were further taxed. The Canadian tax system relies on two levels of taxation. Due to jurisdictional lags in raising dividend tax credits in response to changes in the Act, the combined tax treatment only approached integration when considering dividends. Only Manitoba and Quebec quickly announced and published their increased dividend tax credits, corresponding to the federal increases (Canadian Income Tax Act, 2006). In fact, there was a 6.5 percent loss on average, where only interest income was converted to the SIFT dividend treatment. Tax-exempt domestic investors experienced a loss of 31.5% on all income and net capital gains, but were unaffected

where return of capital, foreign income, eligible and ineligible dividends were distributed. All domestic investors were affected.

Nonresident unit-holders generally receive none of the tax benefits of the cash flow designations reported on the domestic forms. For these investors, the SIFT legislation simply reduced the size of the distribution received by the predicted tax rate of approximately 31.5%, somewhat lower where taxable dividends and return of capital flow into the SIFT trust. A withholding tax is applied, with rates sensitive to existing tax treaties. Generally, there would be no credit assessed for the SIFT tax paid, similar to treatment of other dividends received from Canadian investments. Thus, the loss of approximately 31.5% of investment earnings is the effective pre-tax reduction of income received. These investors now pay a total tax burden of 41.78%, amounting to an after-tax increase of nearly 27% (Elayan et al., 2009).

III. Data and Methodology

The SIFT legislation is included in a relatively simple model for the after-tax value of the firm using the discounted cash flow approach, with the assumption of no growth in the distribution. Despite distribution increases in the period, Glew and Johnson (2011) found the assumption of no growth provided an insignificant impact on pre-tax valuation estimates. Accordingly, time valuation theory provides that the tax reduced distribution divided by the required rate of return is the estimated after-tax value of the SIFT trust in January, 2011. Any convenient time can be chosen for security valuation at this point.

Since the SIFT legislation recognizes the dividend portion as previously taxed and return of capital as tax deferred, after-tax cash flow is determined in several steps. The distribution is first reduced by the eligible and ineligible dividend amounts and the return of capital. This portion is taxed at the SIFT tax rate, τ_S, estimated to be 31.5% at the time of the 2006 announcement to produce an eligible dividend. Prior eligible dividends are added back and that amount is further taxed at the applicable eligible dividend personal tax rate. Ineligible dividends are taxed at the ineligible dividend personal tax rate. Return of capital is not recognized until the trust unit is sold, at which time the adjusted cost base is shifted lower producing an increased capital gain. To simplify both equations below, it is assumed that sale of the trust unit is not planned and the return of capital remains untaxed for both SIFT's and pre-legislation income trusts. The sum of taxed eligible dividends, taxed ineligible dividends, and the return of capital is the after-tax cash flow received by the investor. That sum divided by the investor's after-tax rate of return provides the value of The SIFT security indicated as equation (1).

$$V_S = \frac{Dist\left\{\left[(1-\tau_S)(1-P_{div}-P_{idiv}-P_{Roc})+P_{div}\right](1-\tau_{div})+P_{idiv}(1-\tau_{idiv})+P_{RoC}\right\}}{r} \quad (1)$$

Where V_S is the after-tax value of the SIFT, *Dist* is the amount of the pre-tax distribution, τ_S is the corporate tax rate applicable to the SIFT (predicted at 31.5%), P_{div} is the eligible dividend proportion of the distribution, P_{idiv} is the ineligible dividend proportion of the distribution, P_{RoC} is the return of capital proportion of the distribution, τ_{div} is the marginal personal tax rate on eligible dividend income, τ_{idiv} is the marginal personal tax rate on ineligible dividend income and *r* is the required after-tax rate of return.

For the income trust, assessed prior to the SIFT legislation, the after-tax value depends on the taxation of the distribution's component parts. The dividends are designated as eligible and ineligible in 2006 and thus can be assigned to the correct marginal dividend tax rate. Interest income is reduced by the full marginal tax rate. Capital gains are taxed at half the marginal tax rate. Return of capital flows through untaxed as described above. Finally, foreign income is taxed to render the full marginal tax rate considering all taxes already paid, unless the tax rate is negative where it will be set to zero. Each designated fraction of the distribution is reduced at the applicable tax rate and the sum of these is the after-tax cash flow that was received by the income trust investor. The value of the security is the quotient of that cash flow over the after-tax rate of return, presented as equation (2), also set at January, 2011.

$$V_I = \frac{Dist\left[P_{div}(1-\tau_{div}) + P_{idiv}(1-\tau_{idiv}) + P_{Int}(1-\tau_p) + P_{CG}\left(1-\frac{\tau_p}{2}\right) + P_{RoC} + P_f(1-\tau_f)\right]}{r} \quad (2)$$

Where V_I is the after-tax value of the income trust, *Dist* is the amount of the pre-tax distribution, P_{div} is the dividend proportion of the distribution, τ_{div} is the marginal personal tax rate on dividend income, P_{idiv} is the ineligible dividend proportion of the distribution, τ_{idiv} is the marginal personal tax rate on ineligible dividend income, P_{Int} is the interest/income proportion of the distribution, τ_p is the marginal personal tax rate, P_{CG} is the capital gain proportion of the distribution, P_{RoC} is the return of capital proportion of the distribution, P_f is the foreign income proportion of the distribution, τ_f is the rate for the remaining tax on foreign income and r is the required after-tax rate of return.

The relative value of the SIFT from equation (1) to the income trust from equation (2) will indicate the change in value. Both valuation estimates were set at January, 2011, but we can see that the time consideration cancels out when using the ratio shown as equation (3). In fact, the ratio methodology also overcomes any inaccuracy corresponding to the zero growth assumption, but the described development is used to reduce unnecessary algebraic complexity. The valuation ratio relates the after-tax cash flows of SIFTs and income trusts to each other, avoiding the need for a cost of capital estimate. Where this ratio is less than unity, there is an after-tax loss in value due to the SIFT legislation. In the trivial case, where the distribution contains no dividends or return of capital and the unit-holder is tax-exempt or holds the income trust security in a tax-protected account, the loss is equal to the tax rate on SIFTs, which is 0.315 and the ratio equates to 0.685. The ratio for foreign investors is equivalent as the withholding tax will cancel out of equation (3).

$$\frac{V_S}{V_I} = \frac{\left\{\left[(1-\tau_S)(1-P_{div}-P_{idiv}-P_{Roc})+P_{div}\right](1-\tau_{div}) + P_{idiv}(1-\tau_{idiv}) + P_{RoC}\right\}}{\left[P_{div}(1-\tau_{div}) + P_{idiv}(1-\tau_{idiv}) + P_{Int}(1-\tau_p) + P_{CG}\left(1-\frac{\tau_p}{2}\right) + P_{RoC} + P_f(1-\tau_f)\right]} \quad (3)$$

Where V_S is the after-tax value of the SIFT, V_I is the after-tax value of the income trust, τ_S is the corporate tax rate applicable to the SIFT (predicted at 31.5%), P_{div} is the dividend proportion of the distribution, τ_{div} is the marginal personal tax on dividend income, P_{idiv} is the ineligible dividend proportion of the distribution, τ_{idiv} is the marginal personal tax on ineligible dividend income, P_{Int} is the interest/income

proportion of the distribution, τ_p is the marginal personal tax rate, P_{CG} is the capital gain proportion of the distribution, P_{RoC} is the return of capital proportion of the distribution, P_f is the foreign income proportion of the distribution and τ_f is the rate for the remaining tax on foreign income.

There were 215 income trusts that were directly affected by the tax change announced on October 31, 2006. This number does not include REITs (33), income trusts that had suspended distributions (12), income trusts that were involved in merger discussions at that time (8) or funds of income funds. The designations of income data were manually collected from the publicly available T3, R16 tax forms online at CDS Innovations and filled with information from the company websites, where forms were unavailable. The designations used in all calculations are those reported for 2006, when the October 31st tax announcement lowered trust unit valuations. As affected income trusts did leave the market after the announcement, consistency in results for more recent years is maintained by using these values. Table 1 indicates the summary statistics related to the tax form designations in each of the six categories and demonstrates that there is no typical payout structure, though the largest percentage of the payout is generally the interest or income portion. Less than 22% (47/215) paid only interest or other income to investors and only 7 trusts paid distributions solely from other sources.

Table 1
Income Allocations on 2006 T3, R16 Tax Forms

Of 215 income trusts that were adversely affected by the SIFT tax legislation, income was designated into six categories as indicated in the Table below. For the maximum and minimum values the number of designations in the sample is indicated below the percentage in parentheses.

Designation	Eligible Dividend	Ineligible Dividend	Interest/ Income	Capital Gain	Return of Capital	Foreign Income
Minimum	0 (165)	0 (196)	0 (5)	0 (205)	0 (79)	0 (207)
Mean	0.05	0.01	0.78	0.00	0.15	0.01
Median	0	0	0.88	0	0.03	0
Maximum	1 (1)	1 (1)	1 (47)	0.10 (1)	1 (3)	0.23 (1)

Personal income tax data were collected from Tax Tips website (2011) and verified with the tables provided in published copies of the Acts (2006, 2008, 2010, and 2011). The latter years are included to demonstrate that further movement towards integration has not occurred as intended by the legislation of May 2, 2006. The dividend tax credit information for Ontario and the other jurisdictions was checked against the data listed on the provincial tax forms, retrieved from the Revenue Canada website (2011). Ontario provides the initial comparison since it is the most populous Canadian province with the largest financial centre, whose tax rates generally span those in other jurisdictions. All Canadian jurisdictions are compared in the second analysis.

IV. Results

The calculations for low, middle and high marginal personal tax rates indicate a sizable disparity in the results across the rates, but all average ratios are less than unity. In no case was the value of the SIFT greater than the previous valuation of the income trust. Table 2 includes the valuation ratios for four taxation levels in three calendar years. For the income trusts that simply

redistributed dividends or paid return of capital from the underlying operating entity, the maximum valuation (unity) is received. Five income trusts distributed such funds, with one distributing only eligible dividends and one distributing ineligible dividends. The minimum results correspond to those trusts that distribute all cash as interest or capital gains. In the tax-paying brackets in all years, higher rate payers suffer greater after-tax percentage losses in this category, which is opposite to the effect in the mean result.

Table 2
Valuation Ratio of SIFT/Income Trust at Different (Ontario) Personal Tax Rates

For 215 income trusts, the after-tax valuation of the SIFT is divided by the Income Trust valuation, prior to the legislated tax change, as indicated in equation (3):

$$\frac{V_S}{V_I} = \frac{\left\{\left[(1-\tau_S)(1-P_{div}-P_{idiv}-P_{Roc})+P_{div}\right](1-\tau_{div})+P_{idiv}(1-\tau_{idiv})+P_{RoC}\right\}}{\left[P_{div}(1-\tau_{div})+P_{idiv}(1-\tau_{idiv})+P_{Int}(1-\tau_p)+P_{CG}\left(1-\frac{\tau_p}{2}\right)+P_{RoC}+P_f(1-\tau_f)\right]}$$

The tax rate for the SIFT, τ_S =31.5%, as predicted by the government in the announcement of the change. The expression is evaluated at a zero tax rate, to indicate the effect on distributions paid to pension funds or tax-protected personal plans such as RRSP's and TFSA's, and at three marginal levels to span the Ontario tax rates in 2006, 2008, 2010, and 2011. In 2010, the Ontario combined corporate tax rate dropped below the nominal 31.5% quoted in the 2006 press releases and thus the actual Ontario corporate tax rate was used for calculations in 2010 and 2011. No mean ratio equals unity, indicating a net loss to unit-holders in all cases without conversion to avoid the additional taxation at the SIFT entity level. The 'All Income' row demonstrates incomplete integration in the tax system for all years considered.

Valuation Ratio	τ_p = 0%	τ_p = 21.30%	τ_p = 32.98%	τ_p = 46.41%	Foreign Investor
2006 Maximum	1	1	1	1	1
All Income	0.69	0.92	0.93	0.96	0.69
Median	0.72	0.93	0.94	0.97	0.72
Mean	0.75	0.94	0.95	0.97	0.75
Minimum	0.69	0.90	0.87	0.81	0.69
2008 Maximum	1	1	1	1	1
All Income	0.69	0.93	0.94	0.97	0.69
Median	0.74	0.96	0.97	0.99	0.74
Mean	0.76	0.96	0.96	0.99	0.76
Minimum	0.69	0.91	0.87	0.81	0.69
2010 Maximum	1	1	1	1	1
All Income	0.70	0.94	0.93	0.96	0.70
Median	0.75	0.97	0.96	0.98	0.75
Mean	0.77	0.96	0.96	0.97	0.77
Minimum	0.70	0.90	0.87	0.81	0.70
2011 Maximum	1	1	1	1	1
All Income	0.72	0.94	0.94	0.97	0.72
Median	0.7	0.96	0.96	0.99	0.75
Mean	0.79	0.96	0.96	0.98	0.78
Minimum	0.72	0.88	0.87	0.81	0.72

Ontario taxpayers that invested in a portfolio of income trusts lost value, due to double taxation and lack of tax integration. The second row presented for each year corresponds to the income trusts that distributed only interest or other income to the unit-holder: the portion of the Canadian system assumed to be integrated by the May, 2006 legislative change to increase the dividend gross-up amount and the level of the dividend tax credits. In fact, only Manitoba and Quebec followed the federal government's lead on this by August, 2006. Ontario announced their intention to raise the provincial dividend tax credit to 7.7% at that time, but reneged on such a move until the 2009 tax year, when a lower credit of 7.4% was implemented with reductions thereafter. Simple averaging of the three tax-paying classifications indicates that there remains a loss of 6.3% when receiving a dividend rather than an income payment in Ontario, where 39% of Canadians reside. As a federation with income tax structure determined at two levels, the integration between interest payments and dividends has not been achieved. Integration with respect to capital gains and return of capital has not yet been proposed.

Summarizing these results with a focus towards determining a tax clientele effect is quite difficult. When an investor or fund is tax-exempt, the ratio was expected to equal 0.685 but it does vary with a changing dividend designation and in five cases where dividends or return of capital were distributed by the income trusts, there are no losses in value. As well, the mean after-tax loss of 24.8% (median of 27.8%) is lower than the median pre-tax loss of 31.5% experienced by all unit-holders of the SIFT securities and cannot be separated from that effect. A generalized result on marginal investors could only be made via an assumption that the announcement had no other valuation effect in the market, as was the case in the Cannavan, Finn and Gray (2004) Australian study. The mean after-tax losses of almost 5% across all tax-paying levels further indicate that this is not the case in the Canadian context. There is no comparison group of investors that were unaffected by the change on October 31, 2006.

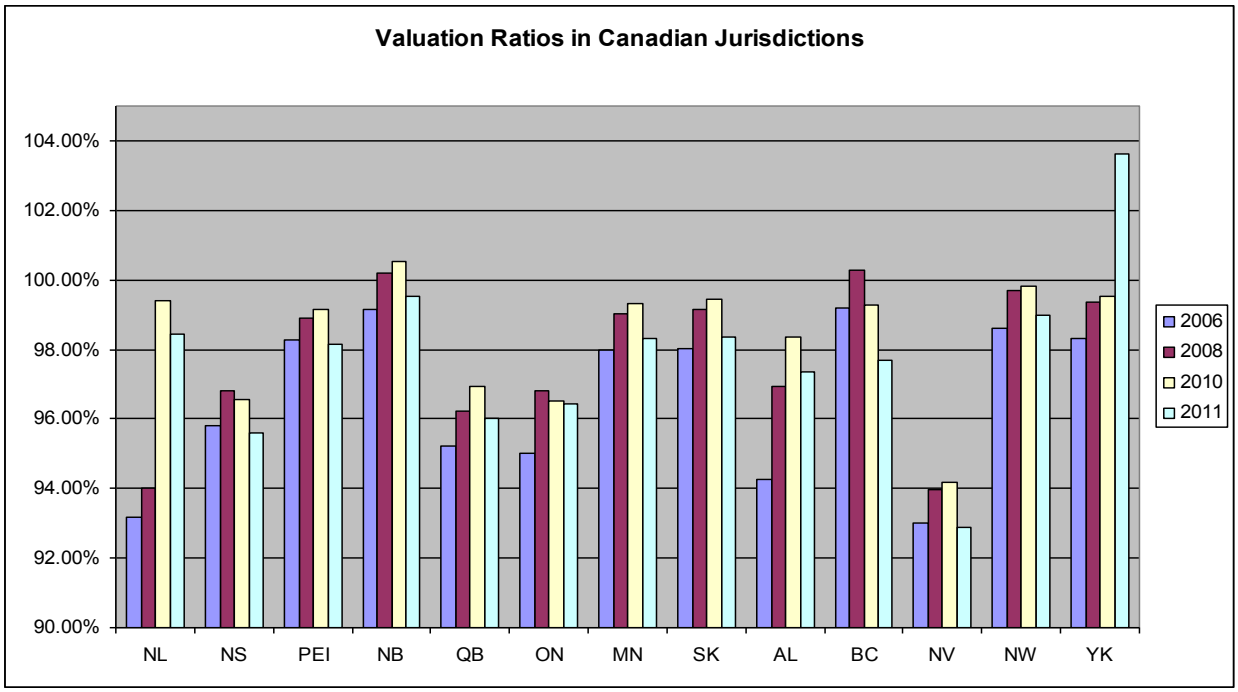
Past studies describe the effect in the highest tax bracket (46.4%), while these data allow a comparison between three tax-paying clienteles. Generally, the after-tax loss was smallest for those in the highest bracket, whose ratios are closest to 100%. The minimum ratios display the reverse pattern, however, where greater losses were experienced by domestic investors in the higher tax brackets, an effect that works counter to tax clientele arguments. The 19.1% loss indicated in the highest tax bracket is approximately 12.5% from the 31.5% maximum loss for tax-exempt and foreign investors, whereas domestic investors in the lowest tax bracket are separated by almost 21.5%. Without knowledge of the income trust holdings of investors in the different tax brackets, generalization of the legislation's effect becomes untenable.

More recent tax years are included to illustrate that conditions have not changed significantly since 2006. The enacted legislation greatly disadvantaged the distribution of capital gains. Integration has not yet been achieved in the Canada's most populous province. The legislation did retain return of capital as an untaxed amount, however, which softened the effect of the change, creating less impact on tax-exempt and foreign investors. Though the data were obviously not available to investors in 2006, we do see that the separation between highly taxed individuals and tax-exempt individuals is further reduced in recent years. Greater differences are uncovered when several jurisdictions are considered.

To judge the extent of integration across all jurisdictions in Canada, the valuation ratios were estimated for three marginal personal taxation levels in each region. The overall average in each year for each jurisdiction is graphically depicted for comparison in Figure 2, which clearly shows variation in the overall average across the regions, relating to the varying taxation levels typical in a federation. Originally losses ranged from 1% in New Brunswick and British Columbia to 7% in Newfoundland and Nunavut. The average results skew towards the low end if relative populations are considered, since Quebec and Ontario indicate losses around 5%. These two provinces combined account for 62% of the population in the 2006 census.

A time trend is also apparent. Although ten jurisdictions adjusted their dividend tax credits in 2006, albeit at partial levels relative to the existing corporate tax rate, most others adopted a higher rate two years later. Several provinces and the federal government subsequently reduced the dividend tax credits to make the income trust structure 1-3% less attractive by 2010. The federal tax credit dropped by 1.2% and five jurisdictions also lowered their credits from the 2008 levels. This resulted in an additional 1% gap between dividend tax treatment and interest tax treatment. The advantage to debt financing has been gradually increasing with dividend credit claw-backs, re-establishing a known concern in the Canadian tax system (Department of Finance 1997).

Figure 2



The average results at each tax level are consolidated into seven regions in Table 3. Regional tax levels differ in percent rates across the sample but remain relatively stable throughout the four year period. Variation in results in Table 3 is largely attributable to changes in the dividend tax credit. In all cases, there is a loss in the after-tax valuation as a result of the SIFT tax legislation in 2006, costing high marginal tax-payers as much as 6.3% in Alberta. The loss is greater at higher marginal tax rates throughout most of the table, but the population

weighted averages are remarkably similar in a given year. In later years, several jurisdictions were close to achieving integration at all tax levels, with British Columbia over-reaching in 2008. Population weighted averages increased until 2010, when a minimum difference of approximately 2% was reached. By 2011, the corporate tax rate had dropped below the estimated combined corporate rate of 31.5% in most jurisdictions, so tax dividend tax credits were further reduced.

The majority of Canadian investors, who owned a diversified portfolio of income trusts, lost value due to the SIFT tax. Only those receiving solely dividends or return of capital were unaffected. In fact, the value of the income trust organizational form to those firms that distribute only dividends is puzzling, and perhaps relates to non-monetary considerations. Return of capital remains an effective method to monetize the depreciation tax benefit, but a payout derived from only these funds seems unsustainable.

Table 3
Mean Valuation Ratios for all Jurisdictions in Canada

For 215 income trusts, the after-tax valuation of the SIFT is divided by the Income Trust valuation, prior to the legislated tax change, as indicated in equation (3):

$$\frac{V_S}{V_I} = \frac{\left\{\left[(1-\tau_S)(1-P_{div}-P_{idiv}-P_{Roc})+P_{div}\right](1-\tau_{div})+P_{idiv}(1-\tau_{idiv})+P_{RoC}\right\}}{\left[P_{div}(1-\tau_{div})+P_{idiv}(1-\tau_{idiv})+P_{Int}(1-\tau_p)+P_{CG}\left(1-\frac{\tau_p}{2}\right)+P_{RoC}+P_f(1-\tau_f)\right]}$$

The tax rate for the SIFT, τ_S, is the lower value of the predicted rate of 31.5% given by the government on announcement of the change and the combined corporate tax rate of the SIFT's jurisdiction. For example, in 2008 Alberta's combined tax rate was 29.5% which is used for all trusts residing in Alberta, but Ontario's combined rate was 33.5%, so the predicted rate of 31.5% is used for all trusts in that jurisdiction. In 2011, the actual corporate tax rate in the appropriate jurisdiction is used. The expression is evaluated at three marginal personal tax levels spanning the tax rates in each jurisdiction in 2006, 2008, 2010, and 2011. The rates do not match exactly due to regional disparities, but these are chosen as the low, middle, and high rates, where the middle rate is closest to the median level. The mean ratio for each tax rate in each jurisdiction for the indicated years is included in the table.

Jurisdiction	Year	Tax Exempt/ Foreign Investors	Lowest Marginal Tax Rate	Middle Marginal Tax Rate	Highest Marginal Tax Rate
Atlantic Provinces	2006	0.75	0.97	0.97	0.96
	2008	0.76	0.98	0.97	0.98
	2010	0.77	0.99	0.99	0.99
	2011	0.79	0.98	0.98	0.98
Quebec	2006	0.75	0.96	0.95	0.95
	2008	0.76	0.97	0.96	0.96
	2010	0.77	0.97	0.98	0.96
	2011	0.79	0.97	0.96	0.95
Ontario	2006	0.75	0.94	0.95	0.97
	2008	0.76	0.96	0.96	0.99
	2010	0.77	0.96	0.96	0.98
	2011	0.79	0.96	0.96	0.98
Manitoba & Saskatchewan	2006	0.75	0.98	0.98	0.98
	2008	0.76	0.99	0.99	0.99
	2010	0.77	1.00	0.99	0.99
	2011	0.79	0.99	0.98	0.98
Alberta	2006	0.75	0.95	0.94	0.94
	2008	0.76	0.97	0.97	0.97
	2010	0.77	0.99	0.98	0.98
	2011	0.79	0.98	0.97	0.97
British Columbia	2006	0.75	0.99	0.99	0.99
	2008	0.76	1.00	1.00	1.00
	2010	0.77	1.00	0.99	0.99
	2011	0.79	0.98	0.98	0.97
Northern Territories	2006	0.75	0.97	0.97	0.96
	2008	0.76	0.98	0.98	0.97
	2010	0.77	0.98	0.98	0.97
	2011	0.79	0.99	0.99	0.98
Population Weighted Average	2006	0.75	0.96	0.96	0.96
	2008	0.76	0.97	0.97	0.98
	2010	0.77	0.98	0.97	0.98
	2011	0.79	0.97	0.97	0.97

The loss in value can only be recouped through elimination of the redundant level of the trust organization, which now carries its own entity tax. Capital gains have been doubly taxed, so retention of these funds is now preferred from a tax perspective. The alternative would be a highly levered structure without the trust layer, allowing the funds to flow directly from the underlying assets to investors comfortable with exposure to risky debt. Privatization is one possibility, whose advantages were recognized prior to the legislation (McKenzie 2006). Otherwise, a market for high yield debt securities or convertible securities must be established.

V. Conclusion

Notwithstanding the legal interpretation of the Act's wording (Bloom and Wiener 2011), Part IX.1 effectively penalized income trusts, which became known as SIFTs, through an additional entity level tax uncharacteristic of those pertaining to other trusts. Canadian taxpayers that owned income trusts were disadvantaged by the decision in two respects: 1) pre-tax cash flows to investors were reduced, and 2) the post legislation after-tax cash valuation of the SIFT is reduced. Unfortunately, simplification in cash flow models does not allow consideration of each

effect independently as both occurred simultaneously on the eve of the tax change announcement on October 31, 2006.

Despite best intentions of movement towards an integrated tax system, straight taxation of interest or income payments remains below the taxation of dividends, carried out at two levels. This study assumed the predicted corporate tax rate of 31.5%, which was below the combined rates for most Canadian jurisdictions in the years studied. Our analysis uncovered a retrenching towards lower dividend tax credits. As such, there was no representative comparison group of trust unit-holders without a valuation loss effective on October 31, 2006. Without a greater knowledge of the holders of income trust units and their portfolios, measuring a clientele effect is untenable.

In hindsight, we can see that the SIFT legislation (Part IX.1, section 197) enacted to level the playing field has only one logical conclusion: the demise of income trusts in all industries with the exception of the real estate sector. The additional level of administration that was once affordable has become costly with an additional level of taxation at the SIFT entity level. The presented model quantifies the relative loss in the after-tax value of those trusts affected by the legislation, based on their 2006 T3, R16 income allocations, assuming no conversion. By converting to a standard corporate form, the organization can avoid double taxation of capital gains but cannot totally recoup the value lost on October 31, 2006.

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Price Dependencies and Investors' Choice

Jeong W. Lee

Abstract

Under the efficient market hypothesis, where many investors resort to "buy and hold" strategies with maximum diversifications, "capitalization-weighted indexation" may offer investors the best risk-return combination. But the existence of non-linear dependences shows that prices of securities may be subject to temporary shocks that obscure their true value. In this case, "fundamental indexation" may achieve returns superior to the capitalization-weighted indexation.

I. Introduction

There are two distinctive groups of thought in the stock market analysis. One school of philosophy holds the assumption that the price of a stock is always in equilibrium. So the current prices of securities fully reflect all known information quickly and accurately. The other group, on the other hand, can be characterized as pursing active investment strategies that are based on the notion that there exists information available to at least one investor that has not been fully integrated into current market prices.

The literature of finance has traditionally assumed that the joint hypothesis including weak form efficiency is a necessary consequence of the general random walk model of security price changes. In this framework, tests of the weak form market efficiency are often presumed to require nothing more than a finding that security price changes over time are uncorrelated for any lag. However, this approach contains the possibility of a specification error. Zero autocorrelation coefficients for all lags of a security price series is a necessary, but not sufficient condition for concluding that the time series follows a random walk. In other words, a pair of variables can be uncorrelated, even though the variables contain a statistical dependence relationship. Independent random variables are uncorrelated, but not vice versa. Of course, the general random walk model requires that price changes for all lags be both uncorrelated and independent.

If stock price movements are more complicated than the random walk model suggests, it will take more sophisticated techniques to explain them. However, many of the traditional approaches (serial correlation, run test, etc) are too unsophisticated or too restrictive to pick up complicated patterns of the price behavior. The purpose of this paper is to fill the gap in the literature by applying rather sophisticated nonlinear models in the search for nonlinear dependence of the stock prices in the capital market. The simplest but the most useful class of nonlinear models is the bilinear model. This model is linear in the 'states' and also in the 'errors' separately but not in both. Thus bilinear models incorporate the class of linear models considered by Box and Jenkins [2], namely the integrated autoregressive moving average (ARIMA) models as special cases. In fact, bilinear series provides a natural generalization from the linear situation to the nonlinear one. In this paper, we find that the price generating mechanism of the security prices studied is nonlinear. In other words, using the Akaike's Information Criterion (AIC) [1], we

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find that the best subset of bilinear models perform better than any kind of autoregressive models.

The improved fit of the bilinear model analyzed, relative to the best linear model indicates that the bilinear model is capable of capturing a significant portion of the nonlinear dependencies which appear in the price generating process. When a nonlinear price generating process is modeled as a linear process, the specification error inherent in the test will be collapsed into the error terms of the model, thus inflating the value of the mean squared error. The significant reduction of the mean squared error achieved with a bilinear model is evidence which supports the hypothesis that price and return generating process contain a significant nonlinear dependency.

Under the efficient market hypothesis, where the current price represents the best, unbiased estimate of the true underlying value of the firm, "capitalization-weighted indexation" may offer investors the best risk-return combination. Because if investors think they can't "beat" the market, they may take passive strategies. But the existence of non-linear dependences shows that prices of securities may be subject to temporary shocks that obscure their true value. In this case, "fundamental indexation" may achieve returns superior to the capitalization-weighted indexation. The fundamental indexation means each stock in the portfolio is not weighted by its market capitalization, but by some fundamental metric, such as aggregate sales, or aggregate dividends. The "noisy market hypothesis" easily explains the size and value anomalies. If a stock falls for reasons unrelated to the changes in the fundamental values, then it's likely that overweighting such a stock will yield better than normal returns. Efficient market believers still dominate the finance research arenas, many practitioners and moonlighting academics including Siegal (2006) recommends that investors overweight value and small stocks in their portfolio.

In the next section, we will investigate relation between nonlinear dependence and market efficiency, followed by the best models for prices and returns. Then implications and conclusions will be discussed.

1. -2 max In (likelihood) + 2 (number of independent parameters). Hence the model with smallest AIC will usually be chosen as the right model.

II. Nonlinear Dependence and Market Efficiency

Random Walk and Price Dependence

The basic characteristic of the random walk hypothesis is that a specific price series follows a simple stochastic process. This implies that successive price changes are independent. In this kind of independent increment process, the past history of a series is of no use in predicting future changes in the series.

The assumptions of perfect capital markets are sufficient conditions for the market to be efficient. But they are not necessary conditions. The existence of the market imperfections, such as transaction costs, costly information, and heterogeneous beliefs among investors are not necessary sources of market inefficiency, they are only potential sources. On the other hand,

even if stock prices deviate significantly from the random walk process, market participants may not have profitable trading opportunities by acting on the deviations because of market frictions. In this situation, it is possible to reject the random walk model without rejecting the notion of market efficiency. The random walk model can be viewed as an extension of the general expected return or the "fair game" model. Samuelson (1965) provided the efficient market notion that prices follow a martingale stochastic process. This is commonly regarded as the fair game model of the efficient market. However, the fair game model does not say much about the stochastic process generating returns, since it simply states that the conditions of market equilibrium can be expressed in terms of expected returns.

The notion that efficiency implies "current prices fully reflect all available information" is too general to be concretely tested. Hence we need a statistically tractable way of measuring this intuitive notion of an efficient market. Fama (1970) states if the current price of a security "fully reflects" available information then successive price changes are independent. He argues that market efficiency with the assumption of market equilibrium implies that the autocorrelations of the returns on any security are zero for all values of the lag t. Therefore, there is no way to use information available at t-1 as the basis of a correct assessment of the expected value of residuals (e_t) other than zero. Praetz (1979) elaborates this statement by saying that market inefficiency implies that from time to time the process of assessing information to stock prices is somewhat incomplete. These errors of assessment generally show up as correlated return sequences. Accordingly, in many cases, it has been presumed sufficient to test the autocorrelation of the time series and if it is zero for all lags then conclude that the series follows a random walk.

However, the above argument is true provided the time series follows a normal distribution. In other words, a pair of variables can be uncorrelated yet not be independent, but not vice versa. In this context, the correlation coefficient is just a measure of the degree to which two random variables are linearly related. Again, if two random variables come from bivariate normal distribution, uncorrelated variables are independent. If security prices are not normal, then even if they are uncorrelated they may not be independent. Therefore, if the linearity of the process is rejected we must also reject the normality assumption. But if the stock prices and returns are generated by the nonlinear processes, even though they might be uncorrelated, they might not be independent.

Accordingly, if the true processes generating daily stock prices and returns are nonlinear, the test of the zero correlation is not appropriate for the test of the random walk, or for the test of the market efficiency. The discovery of nonlinear process is inconsistent with the notion of an independent incremental process.

Independence and nonlinear process

For the general case of non-Gaussian processes, consider the problem of prediction the future value of a process, given observations up to time t. In the case of an independent process, 91' the past contains no information on the future. In the case of an uncorrelated process, el, the past contains no information on the future if the predictors are linear. However, for the nonlinear predictors, the past may well contain useful information on the future values. Consider the following simple example.

$$X_1 = e_t + \beta \ e_{t-1} \ e_{t-2} \qquad (1)$$

where e_t is an independent process with zero mean and constant variance.
Then, $E(X_t) = 0$, and $\{X_t\}$ is a white noise process, since Cov $(X_t, Xs) = E(X_t X_s)$. However, the random variables X_t are not independent. In other words, there exists a relationship among X_{t-2}, X_{t-1}, and X_t for all t since

$$E\left(X_{t-2}X_{t-1}X_t\right) = E\left(e_{t-2}{}^2 e_{t-1}{}^2\right) = \beta\sigma_e{}^2. \quad (2)$$

Therefore, if daily stock prices and returns are generated by a nonlinear, non-Gaussian process, then the independence of price movements is questionable.

III. The Best Models for Stock Prices and Returns

For our investigation, we utilized 5 year daily closing prices of the S & P 500 drawn from the Wall Street Journal. The Index prices were for trading days during the period January 3, 2006 to December 31, 2010. In addition to the daily prices, daily index returns were obtained from the CRSP universe of stock and index returns for each trading day in the sample. All the models are determined based on daily prices (and returns) for one full year from 2006 to 2010, then we take the 5 year average values.

Fama (1970) showed that a time series of daily stock returns exhibit low levels of significant autocorrelation for lags varying between 1 and 10 days. Hence, for the S & P 500, the maximum lag is chose to be equal to 10. In this analysis, we employ the Akaike's Information Criterion (AIC) as the criteria for the model selection. It can be shown that AIC is a generalization of the maximum likelihood principle. Using AIC, we find that the best Autoregressive (AR) model for the stock price generating mechanism is the AR (1) model, where 5 year average mean sum of squares of errors ($\sigma_e{}^2$) is 2.2475 and AIC is 228.324. However, the best AR model for the stock price which has the lowest mean sum of squares of errors is the full AR (10) model with ($\sigma_e{}^2$) average of 2.2168 and AIC of 243.875. Following the procedures of the S. Rao et.al, (1981), the best bilinear model for the stock price generating process is Bilinear (BL) (1, 0:10, 10) with ($\sigma_e{}^2$) of 1.9828 and AIC of 218.158.

The best bilinear model has lower AIC value and lower mean sum of squares of errors than each of the ”best" AR models. The results are summarized in Table 1. The bilinear model not only has smaller mean sum of squares but also shows smaller AIC value when compared to other models. As a result, in the daily S & P 500 price generating process, the nonlinear model is a better fit than the linear models.

Table I
Value of $\sigma_e{}^2$, AIC, and No. of Parameters (Daily S & P 500 Price Data)

Model	Full AR (10)	Subset AR	Subset Bilinear
$\sigma_e{}^2$	2.13	2.25	1.98
AIC	243.88	228.32	218.16
No. of Parameters	11	2	7
The Best Choice			x

We then applied the same process above to the daily S & P 500 return data to derive the best subset of AR (10), and the best subset of BL (10, 0:10, 8). Table 2 presents the results of the scaled (x 10^4) Index returns with each model. In the return generating process as well, the bilinear model has less residual variance and less AIC than the autoregressive models.

Table II
Value of σ_e^2, AIC, and No. of Parameters (Daily S & P 500 Return Data: x 10^4)

Model	Full AR (10)	Subset AR	Subset Bilinear
σ_e^2	7391.29	7782.16	6499.04
AIC	3195.89	2769.93	2397.99
No. of Parameters	11	4	9
The Best Choice			x

IV. Implications

Why these dependences of the price and return date are observed? Three possible reasons can be suggested. Firstly, dependences may be because of the divergence of investors' expectations. That is each individual may have heterogeneous beliefs about future events. For example, each may assess different probability distributions on the asset returns. Secondly, even if individuals do have the same probability distributions on the future events, their interpretations about those events can be different. Lastly, such dependences may be because of the diverse risk aversions for investors. Depending on the characteristics of an individual's utility function, each may require different level of risk premium for a given project. Hence the actuarial value of that project will not be unique. Accordingly, some good opportunities to a specific risk averse individual will not be good enough to others and vice versa.

Under the efficient market hypothesis, where the current price represents the best, unbiased estimate of the true underlying value of the firm, "capitalization-weighted indexation" may offer investors the best risk-return combination. Because once investors believe that they can't "beat" the market, they will take passive strategies. But the existence of non-linear dependences shows that prices of securities may be subject to temporary shocks that obscure their true value. In this case, "fundamental indexation" may achieve returns superior to the capitalization-weighted indexation. The fundamental indexation means each stock in the portfolio is not weighted by its market capitalization, but by some fundamental metric, such as aggregate sales, or aggregate dividends. The "noisy market hypothesis" easily explains the size and value anomalies. If a stock falls for reasons unrelated to the changes in the fundamental values, then it's likely that overweighting such a stock will yield better than normal return.

V. Conclusions and Further Suggestions

Linear models have been used successfully for analyzing time series data. But there are cases when it has been recognized that linear time series may not be adequately explaining the underlying random movement. For these cases we may utilize nonlinear models in the time series analysis. Nonlinear models admit patterns of prices which are not serially independent and patterns of realized stock prices and returns which do not arise from an independent increment process. If the stock market has no "memory" or if the current stock prices are completely independent of the past, then is the study of historic data and fundamental factors utterly useless?

We find that the price and the return generating mechanisms are nonlinear. For the daily stock price and return generating process of the S & P 500 Index, we find that the best subset of bilinear models perform better than any kind of autoregressive models. The fact that the best bilinear model possesses superior explanatory abilities relative to the linear model suggests that the mechanism which generates security prices and returns is more complex than the literature suggests. An implication of this complexity is the possibility of earning economically significant arbitrage profits from a superior understanding of the nonlinear dependencies which exist in security price series.

For the practical purposes, implications for the portfolio management are rather significant. Under the efficient market hypothesis, where many investors resort to “buy and hold” strategies with maximum diversifications, “capitalization-weighted indexation” may offer investors the best risk-return combination. But the existence of non-linear dependences shows that prices of securities may be subject to temporary shocks that obscure their true value. In this case, “fundamental indexation” may achieve returns superior to the capitalization-weighted indexation. Further research is needed to determine what causes these nonlinear dependences of security prices and returns.

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Market Quality and Information Known to Market Makers

Arman Kosedag and Jinhu Qian

Abstract

Market makers often have concentration of information due to their unique positions in securities markets. Whether their information sources should be made accessible to other market participants is a public policy concern. This article provides insights into the issue in theoretical perspective. We show that disclosure of market makers' information tends to increase market liquidity and decrease the costs of uninformed trading when the competition in market making is intense. When the competition is weak, however, the disclosure will decrease market liquidity and increase the trading losses of uninformed traders. The results have public policy implications for improving the quality of securities markets and promoting the interest of public investors.

I. Introduction

Market makers often have access to some information that is not accessible to other market participants. Exchange specialists, for example, exclusively handle the limit order book and see more of consolidated order flows. Over-the-counter dealers may maintain close contact with the firms whose securities they trade and can receive orders directly from customers, including institutional investors. These exclusive sources of information provide market makers a comparative advantage over other players in the marketplace. Yet, whether market makers' informational access should be open to other market participants is a public policy concern for improving the quality of securities markets and promoting the interests of public investors. Some quick thoughts seem to hint that the question may not have a simple, straightforward answer. On the one hand, exclusive possession of information by market makers may hinder the practice of fair and competitive securities trading if they pursue to profit from their privileged positions.[1] On the other hand, market makers as suppliers of liquidity or immediacy, sets the terms of trade to battle privately informed traders at the expense of uninformed traders.[2] Privileged information may enhance market makers' selection against informed traders and thus improve the terms of trade for uninformed traders. Therefore, it is not clear that opening market makers' informational access will have a positive net impact.

This article attempts to provide insights into the issue by examining the effect of opening market makers' informational access on the performance of securities markets. The analysis is based on a trading model in the spirit of Kyle (1985, 1994). In particular, a single risky security is traded by three types of risk-neutral traders: informed traders, market makers, and uninformed traders. Both informed and uninformed traders submit market orders to market makers, who set the pricing rule and absorb the net demand from the others. While uninformed trading is based on liquidity reasons, informed traders trade strategically on private information and hide it behind uninformed trading. In the current model, market makers are assumed to possess private information related to the fundamental value of the security before trading takes place. They

[1] Christie and Schultz (1994) and Christie, Harris, and Schultz (1994) present evidence that NASDAQ dealers implicitly collude to set bid-ask spreads for their stocks above competitive levels.

[2] See Glosten and Milgrom (1985), (1987), Glosten and Harris (1988), and Stoll (1989) among others for theoretical arguments and empirical evidence.

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incorporate the information into their pricing rule when trading begins. Informed traders thus face uncertainty about market makers' pricing rule when they choose order sizes. The model also assumes imperfect competition among market makers so they earn positive expected profits from market making. This assumption makes it possible to take account of possible changes of their competition intensity as well as trading profits in the analysis.

We compare the characteristics of the market as defined above, where market makers have private pre-trade information, with the characteristics of a market elsewhere identical except that market makers' pre-trade information is publicly disclosed prior to trading. Our main focus is on changes of market liquidity, the informational efficiency of equilibrium prices, and the distribution of trading profits across three types of traders as a result of the disclosure. A key argument in the analysis is that disclosure of market makers' pre-trade information has two effects working in opposite directions. First, it enhances informational strength of informed traders by eliminating their uncertainty about market makers' pricing schedule. Facing relatively strengthened informed traders, market makers are prone to increase the sensitivity of prices to total net order flows submitted by informed and uninformed traders. This tends to decrease market liquidity and increase the expected costs of uninformed trading. Second, the disclosure increases the intensity of information-based competition among informed traders, thereby weakening their collective position in the trading game. Market makers would afford to loosen the price sensitivity to total net order flows. This effect tends to increase market liquidity and decrease the expected costs of uninformed trading.

We show that the net impact of disclosure of market makers' pre-trade information depends on the intensity of competition in both informed trading and market making, measured respectively by the number of informed traders and the number of market makers. In general, the disclosure tends to enhance market liquidity and improve the terms of trade for uninformed traders in a more competitive environment. Specifically, the disclosure tends to increase market liquidity and decrease the expected costs of uninformed trading in a market with intense competition in both informed trading and market making. In this case, the expected trading profits of informed traders and market makers tend to decline. When the intensity of competition is low, however, the disclosure will decrease market liquidity and increase the trading losses of uninformed traders to the informed and market makers. These results are not qualitatively changed if the entry or exit of market participants is allowed in the model.

The results have straightforward policy implications. As it has been recognized in previous studies, liquidity of a market increases assets prices (Amihud and Mendelson (1986, 1990, 1991)) and makes corporate governance more effective (Maug (1998)). The presence of uninformed traders enhances liquidity of a market with privately informed trading (Kyle (1985) and Admati and Pfleiderer (1988)). To enhance these aspects of market performance, our study suggests that it is beneficial to open market makers' exclusive informational access in the markets of actively traded securities. Easley et al. (1996) provide direct evidence that high volume stocks, normally having intense competition in market making, tend to have a higher arrival rates of informed traders. For the same reason, preserving informational privilege of market makers will enhance liquidity and protect uniformed traders in the markets of inactive securities, where the competition is in informed trading and market making is usually weak.

Several recent articles have studied closely related issues. Admati and Pfleiderer (1991) investigate the effect on market performance of the sunshine trading strategy, following which some liquidity traders identify their trades as not motivated by private information before they submit their orders. Using a noisy rational expectations model, the authors show that preannouncement typically decreases the trading costs of announcing liquidity traders and increases the informativenss of the equilibrium price. Foster and George (1995) examine how disclosure of the information on liquidity trade affects the market equilibrium when a subset of traders has better information of liquidity trading. They show that revealing the direction of liquidity trade in advance decreases the expected trading losses of liquidity traders. This result is consistent with the findings of Admati and Pfleiderer (1991). However, revealing the magnitude of trade decreases the trading losses of liquidity traders only if there is sufficient competition among informed traders. Madhavan (1992) analyzes how transparency of orders affects market behaviors and viability when order flow information is observable to both market makers and traders. Pagano and Roell (1996) consider how transparency of orders to market makers affects the trading costs of informed and uninformed traders. More recently, Lin and Zhang (2011) find that public information harms the insiders but benefits outsiders and noise traders. Kim and Mehrotra (20007) show that NASDAQ dealers make market only for stocks where they have competitive advantages in accessing order flow and in information. Abraham and Harrington (2011) find market makers use the information contained in stock buy and sell volumes to determine future stock bid and ask quotes. Our study adds to the literature. We focus on the impact of opening the exclusive informational accesses of market makers and explicitly recognize the importance of competition in both informed trading and market making.

The remainder of this article is organized as follows. Section II describes the model and derives the market equilibrium in both disclosure and non-disclosure cases. Section III characterizes changes of market performance due to the disclosure by comparing the equilibrium results of the two cases. Section IV concludes the paper.

II. The Economic Framework

A. Model description

Consider a game of one-shot trade of a risky security by three types of risk-neutral traders: *N* informed traders, *M* market makers, and an undetermined number of uninformed traders. The fundamental value of the security, *v*, is a random variable normally distributed with mean $\bar{v}$ and variance σ_v^2. Before trading takes place, informed traders become informed by observing a signal $\phi = v + \varepsilon$, where error ε is independent of *v* and is normally distributed with mean zero and variance σ_ε^2. The conditional probability distribution of *v* to informed traders thus has mean

$$E(v/\phi) = (1 - I_\phi)\bar{v} + I_\phi \phi,$$

and variance

$$Var(v/\phi) = \sigma_v^2 (1 - I_\phi),$$

where $I_\phi = \sigma_v^2 / (\sigma_v^2 + \sigma_\varepsilon^2)$, $0 < I_\phi \leq 1$. I_ϕ (= $[\sigma_v^2 - Var(v/p)]/\sigma_v^2$) reflects the extent of uncertainty about *v* being reduced on the basis of an observation of ϕ, and can thus be viewed as

a measure of the informativeness of the signal. $I_\phi = 1$ if the signal is perfectly informative ($\sigma_\varepsilon^2 = 0$), and $I_\phi \to 0$ if the signal carries little information ($\sigma_\varepsilon^2 \to +\infty$). In addition, market makers also observe a pre-trade signal $\varphi = v + \eta$, where error η is independent of v and ε and is normally distributed with mean zero and variance σ_η^2. Observing φ, market makers have

$$E(v/\varphi) = (1 - I_\varphi)\bar{v} + I_\varphi \varphi,$$

and

$$Var(v/\varphi) = \sigma_v^2 (1 - I_\varphi),$$

where $I_\varphi = \sigma_v^2 / (\sigma_v^2 + \sigma_\eta^2)$, $0 < I_\varphi < 1$, measures the informativeness of signal φ.

Given the above information setting, both informed traders and market makers make strategic decisions to maximize their expected profits from trading the security. Specifically, each of the informed determines the size of his market order $x_i = X(\phi; Y)$, i = 1, 2, … N, as a function of his available information; each of the market makers, trading by limit orders, chooses his demand $y_j = Y(p, \varphi; X)$, j = 1, 2, … M, as a function of market price p and his pre-trade information. In addition, each trader's decision takes into account the strategy of other traders. Note that in the above expressions we have applied the standard symmetry result to ease the notation complexity: in equilibrium all market makers choose the same strategy function Y and all informed traders choose the same strategy function X (see, e.g., Kyle (1984) and Admati and Pfleiderer (1988)). Unlike the informed, uninformed traders trade exogenously, not motivated by information related to the fundamental value. They trade on the basis of liquidity reasons, including risk-exposure adjustment, tax planning, the desire for immediate consumption, and idiosyncratic wealth shocks. Let the total demand from uninformed traders denoted by a random variable z. z is assumed to be independent of v, ϕ, and φ, and normally distributed with mean zero and variance σ_z^2.

Our model follows the basic structure of the models in Kyle (1984, 1985). In such a model, market makers do not see individual orders but rather set a market-clearing price given the aggregate net order flow. Yet, they can infer about informed traders' private information from the aggregate order flow. On the other hand, informed traders hide their private information from market makers behind uninformed trading and incorporate their expectations on market makers' pricing rule into the decision in selecting order size and trading intensity. As in Gould and Verrecchia (1985) and Kumar and Seppi (1994), market makers in our model are treated as quasi-insiders, possessing private pre-trade information. This information setting affects the strategic decision of informed traders, who do not observe market makers' pre-trade signal. In another different aspect, the current model assumes that the market making is not perfectly competitive so market makers can earn positive expected profits. Each market maker announces a demand schedule (inverse of his pricing schedule) and other traders can allocate their orders among different market makers. The number of competing market makers measures the intensity of competition in market making. As it will be shown in Section III, the intensity of competition affects changes of market performance due to disclosure of market makers' pre-trade information.

B. Equilibrium with no disclosure of market makers' pre-trade information

In this subsection we derive market equilibrium when there is no disclosure of market makers' pre-trade information. In the trading game that our model defines, informed traders and market makers trade to maximize their expected profits at the expense of uninformed traders. Evidently, the profits of an informed trader, denoted $\Pi_i^{IT}(X,Y)$, are given by $\Pi_i^{IT}(X,Y) = x_i(v-p)$, $i = 1, 2, \ldots N$, and the profits of a market maker, denoted $\Pi_j^{MM}(X,Y)$, are given by $\Pi_j^{MM}(X,Y) = y_j(v-p)$, j = 1, 2, … *M*. Further, the aggregate losses of liquidity traders, denoted *L*(*X*, *Y*), are given by $L(X,Y) = z(p-v)$. These expressions emphasize the dependence of profits or losses on strategy functions *X*, *Y*. Also denote the price as $p = P(w; X, Y)$, where $w = \sum_{i=1}^{N} x_i + z$, is the net market orders from informed and uninformed traders. Nash equilibrium is defined as a pair of *X*, *Y*, satisfying the following three conditions:

(1) Profit maximization of informed traders: For any alternative trading strategy *X'* and for any observation ϕ,

$$E[\Pi_i^{IT}(X,Y)/\phi] \geq E[\Pi_i^{IT}(X',Y)/\phi],\ i = 1, 2, \ldots N.$$

(2) Profit maximization of market makers: For any alternative demand schedule *Y'* and for any observation φ,

$$E[\Pi_j^{MM}(X,Y)/p,\varphi] \geq E[\Pi_j^{MM}(X,Y')/p,\varphi],\ \text{j} = 1, 2, \ldots M.$$

(3) Market clearing condition:

$$\sum_{i=1}^{N} x_i + \sum_{j=1}^{M} y_j + z = 0.$$

Note that the last two conditions converge to the market efficiency condition when the number of market makers, *M*, approaches infinity. With perfectly competitive market makers the equilibrium price is set to equal the expected fundamental value conditional on all information available to market makers. The following lemma gives the unique linear equilibrium with no disclosure of market makers' pre-trade information.

Lemma 1: *When market makers' pre-trade signal, φ, is not disclosed prior to trading, the equilibrium demand functions of informed traders and market makers are given as follows:*

$$X(\phi;Y) = \beta(\phi - \bar{v})$$

$$Y(p,\varphi;X) = -\frac{1}{M\lambda}[p - E(v/\varphi)] - \frac{(M-2)N\beta}{(M-1)M}[E(v/\varphi) - \bar{v}],$$

with the equilibrium linear pricing schedule given by:

$$P(w;X,Y) = E(v/\varphi) + \lambda\{w - \frac{(M-2)N\beta}{M-1}[E(v/\varphi) - \bar{v}]\},$$

where

$$\beta = [\frac{M-2}{(M+N-1)N}]^{1/2} \frac{\sigma_z}{\sigma_v} I_\phi^{1/2} \quad (1)$$

$$\lambda = [\frac{(M+N-1)N}{(M-2)(N+1)^2}]^{1/2} [1 - \frac{(M-2)NI_\varphi I_\phi}{(M-1)(N+1)}]^{-1} \frac{\sigma_v}{\sigma_z}(1-I_\varphi)I_\phi^{1/2}. \quad (2)$$

Proof of Lemma 1: Assume the demands of informed traders and market makers are given by:

$$X(\phi;Y) = \alpha + \beta\phi$$
$$Y(p,\varphi;X) = \gamma_0 + \gamma_1 p.$$

In equilibrium, the market clearing condition can be written as:

$$N(\alpha + \beta\phi) + M(\gamma_0 + \gamma_1 p) + z = 0.$$

Solving for p, we obtain

$$p = -\frac{\gamma_0}{\gamma_1} - \frac{1}{M\gamma_1} w,$$

where $w = N(\alpha + \beta\phi) + z$, is the net orders from informed and uninformed traders submitted to market makers. To market makers, w is informationally equivalent to p.

Each market maker takes into account the impact of his own demand, y, on the equilibrium price. Taking the strategies of informed trader and other market makers as given, he solves

$$\underset{y}{Max}\, E[y(v - p) / w, \varphi]$$

Note that

$$E[y(v - p) / w, \varphi] = E\{y[v + \frac{\gamma_0}{\gamma_1} + \frac{1}{(M-1)\gamma_1}(w + y)] / w, \varphi\}.$$

Each informed trader, taking the strategies of other informed traders and the expected demand schedule of market makers as given, faces the following maximization problem:

$$\underset{x}{Max}\, E[x(v - p) / \phi].$$

Note

$$E[x(v - p) / \phi] = E[x\{v + \frac{\gamma_0}{\gamma_1} + \frac{1}{M\gamma_1}[(N-1)(\alpha + \beta\phi) + x + z]\} / \phi].$$

Then all parameters in Lemma 1 can be derived from the solutions of the above maximization problems. The details of the derivation have been excluded but are available from the authors upon request.

In Lemma 1 the trading strategy of informed traders is captured by parameter β, which measures their trading intensity in response to private signal ϕ. β increases in both the signal's informativeness, I_ϕ, and the variance of uninformed trading, σ_z^2. This reflects a well-known fact that informed traders trade on private information behind uninformed trading. It is worthwhile noting that the equilibrium price schedule depends on market makers' observation of signal φ. This dependence has implications for the behavior of informed traders. Since they do not observe the signal, informed traders face uncertainty about not only the execution price but also the location of the equilibrium price schedule. As a result, informed traders are unable to fully anticipate the response of market prices to changes of the total net order flows.

The slope of the market makers' aggregate demand function, λ^{-1}, characterizes their strategic behavior. In fact λ^{-1} is commonly viewed as a measure of market liquidity, or depth, since λ is the parameter measuring the sensitivity of equilibrium prices to net order flows. From

expression (2), this measure of market liquidity decreases with the informativeness of informed traders' signal and increases with the variance of uninformed trading. It is a well-documented result that market makers respond to strengthening informed trading (uninformed trading) by making the market less (more) liquid. In the current mode, λ^{-1} also increases with the informativeness of market makers' pre-trade signal, I_{φ}. This implies that better-informed market makers provide a more liquid market, other things held constant. Obviously, the driving force behind this is the competition among market makers themselves.

The calculation of the expected trading profits or losses of traders is straightforward. The expected total losses of uninformed traders are given by:

$$\begin{aligned} E[L(X,Y)] &= E[z(p-v)] \\ &= \lambda\sigma_z^2. \end{aligned} \tag{3}$$

The expected total profits of informed traders and that of market makers are given respectively by:

$$\begin{aligned} E[\Pi^{IT}(X,Y)] &= NE[x(v-p)] \\ &= \frac{M-2}{M+N-1}\lambda\sigma_z^2, \end{aligned} \tag{4}$$

and

$$\begin{aligned} E[\Pi^{MM}(X,Y)] &= ME[y(v-p)] \\ &= \frac{N+1}{M+N-1}\lambda\sigma_z^2. \end{aligned} \tag{5}$$

Both informed traders and market makers generally make positive expected profits at the expense of uninformed traders. When the number of market makers, *M*, approaches infinity, the increasing competition in market making will ultimately drive the expected trading profit earned by each market maker to zero. However, uninformed traders still incur losses to non-competitive informed traders even when market making is perfectly competitive. The expected profit of each informed trader declines as N increases.

We analyze the extent to which the equilibrium security price reflects the fundamental value of the security. This is important because it indicates the performance of a market as a price discovery mechanism. To be consistent with the measure of information in this study, the informativeness of prices is defined as $I_p \equiv \frac{\sigma_v^2 - Var(v/p)}{\sigma_v^2}$. I_p measures the extent to which an observation of the equilibrium price decreases an uninformed individual's uncertainty about the security's value *v*. Also among our concerns are variability of equilibrium prices and variability of price changes after trading, measured respectively by *Var(p) and Var(v-p)*. These aspects of market performance have been extensively examined in recent studies. In this article we focus only on the direction of changes in these variables as a result of disclosing market makers' pre-trade information.

C. Equilibrium with disclosure of market makers' pre-trade information

We now consider traders' behaviors when the pre-trade information of market makers is publicly disclosed before trading takes place. Observing both public signal φ and private signal ϕ, informed traders have

$$E(v/\varphi,\phi) = E(v/\varphi) + \frac{Cov(v,\phi/\varphi)}{Var(\phi/\varphi)}[\phi - E(v/\varphi)]$$
$$= (1-\hat{I}_\phi)E(v/\varphi) + \hat{I}_\phi\phi,$$

and

$$Var(v/\varphi,\phi) = Var(v/\varphi)(1-\hat{I}_\phi),$$

where $\hat{I}_\phi \equiv \frac{Var(v/\varphi)}{Var(v/\varphi)+\sigma_\varepsilon{}^2}$, $0 < \hat{I}_\phi \le 1$, measures the informativeness of signal ϕ when φ is public information. In this case, the size of an informed trader's market order $\hat{x}_i = \hat{X}(\varphi,\phi;\hat{Y})$, i = 1, 2, … N, is a function of both ϕ and φ, given the demand schedule of market makers, $\hat{Y}$. Similarly, $\hat{y}_j = \hat{Y}(\hat{p},\varphi;\hat{X})$, j = 1, 2, … M, denotes the demand of a market maker in this case.

The Nash equilibrium of the strategic behaviors of informed traders and market makers can be defined identically under the information disclosure. Trading strategies $\hat{X}$, $\hat{Y}$, are chosen to satisfy the profit maximization conditions of each informed trader and each market maker and to satisfy the market clearing condition. The following lemma presents equilibrium result under the disclosure.

Lemma 2*: When market makers' pre-trade signal φ is disclosed prior to trading, the equilibrium demand functions of informed traders and market makers are given as follows:*

$$\hat{X}(\varphi,\phi;\hat{Y}) = \hat{\beta}[\phi - E(v/\varphi)]$$
$$\hat{Y}(\hat{p},\varphi;\hat{X}) = -\frac{1}{M\hat{\lambda}}[\hat{p} - E(v/\varphi)] - \frac{(M-2)N\hat{\beta}}{(M-1)M}[E(v/\varphi) - \bar{v}],$$

with the equilibrium pricing schedule given by:

$$\hat{P}(\hat{w};\hat{X},\hat{Y}) = E(v/\varphi) + \hat{\lambda}\hat{w},$$

where

$$\hat{\beta} = [\frac{M-2}{(M+N-1)N}]^{1/2}[\frac{\sigma_z{}^2}{Var(v/\varphi)}]^{1/2}\hat{I}_\phi{}^{1/2} \quad (6)$$

$$\hat{\lambda} = [\frac{(M+N-1)N}{(M-2)(N+1)^2}]^{1/2}[\frac{Var(v/\varphi)}{\sigma_z{}^2}]^{1/2}\hat{I}_\phi{}^{1/2}. \quad (7)$$

Proof of Lemma 2: Assume $\hat{X}(\phi;\hat{Y}) = \hat{\alpha} + \hat{\beta}\phi$ and $\hat{Y}(\hat{p},\varphi;\hat{X}) = \hat{\gamma}_0 + \hat{\gamma}_1\hat{p}$. Then the market clearing condition leads to $\hat{p} = -\frac{\hat{\gamma}_0}{\hat{\gamma}_1} - \frac{1}{M\hat{\gamma}_1}\hat{w}$.

The maximization problem of each market maker can be solved in the same way as in the case without the information disclosure.

Informed traders, now observing φ, faces no uncertainty about the strategic parameters of market makers. That is, both $\hat{\gamma}_0$ and $\hat{\gamma}_1$ are deterministic to them. Each speculator, taking the strategies of other informed traders and market makers as given, solves the following problem:

$$\underset{\hat{x}}{Max}\, E[\hat{x}(v - \hat{p}) / \varphi, \phi].$$

Note

$$E[\hat{x}(v - \hat{p}) / \varphi, \phi] = E[\hat{x}\{v + \frac{\hat{\gamma}_0}{\hat{\gamma}_1} + \frac{1}{M\hat{\gamma}_1}[(N-1)(\hat{\alpha} + \hat{\beta}\phi) + x + z]\} / \varphi, \phi].$$

Then all parameters in Lemma 2 can be derived from the solutions of the above maximization problems. A more detailed derivation is available from the authors.

In general, the equilibrium properties of traders' strategic behaviors remain unchanged. Yet, some differences arise as a result of disclosure of market makers' pre-trade information. First, informed traders incorporate the information provided by signal φ into their trading strategy, reflecting in increased trading intensity $\hat{\beta}$. Second, the equilibrium price schedule under the disclosure is deterministic to informed traders because φ is public information. In this case the zero-volume price $\hat{P}(0; \hat{X}, \hat{Y})$ is equal to the market makers' pre-trade conditional expectation $E(v/\varphi)$. Finally, the value of market liquidity measure λ^{-1} may change due to the information disclosure. Detailed discussions will be presented in Section III.

The expected trading losses of uninformed traders and the expected trading profits of informed traders and market makers are derived as follows:

$$E[\hat{L}(\hat{X}, \hat{Y})] = \hat{\lambda}\sigma_z^{\,2} \tag{8}$$

$$E[\hat{\Pi}^{IT}(\hat{X}, \hat{Y})] = \frac{M-2}{M+N-1}\hat{\lambda}\sigma_z^{\,2} \tag{9}$$

$$E[\hat{\Pi}^{MM}(\hat{X}, \hat{Y})] = \frac{N+1}{M+N-1}\hat{\lambda}\sigma_z^{\,2}. \tag{10}$$

The last expression shows that non-competitive market makers are still expected to make profits on the basis of information provided by the total net orders even though they have no private pre-trade information. Under the information disclosure, the informativeness of equilibrium prices is similarly defined as $\hat{I}_p \equiv \frac{\sigma_v^{\,2} - Var(v/\hat{p})}{\sigma_v^{\,2}}$. Variability of equilibrium price and variability of price changes after trading are measured by $Var(\hat{p})$ and $Var(v - \hat{p})$, respectively.

III. Impact of the Disclosure of Market Maker's Pre-trade Information on Market Performance

In this section we compare the equilibrium results with and without disclosure of market makers' pre-trade information about the fundamental value. We have shown that the strategic behaviors of informed traders and market makers depend on their available information and their relative informational strength. Subsequently, the information setting among all participants in

the market plays an important role in determining market liquidity, the distribution of profits across traders, and the informational efficiency of equilibrium price. Disclosure of market makers' pre-trade information is likely to affect these measures of market performance since it alters the information asymmetries between informed traders and market makers.

Apparently, disclosure of market makers' pre-trade information has two effects on market liquidity. First, it increases the relative informational strength of informed traders. As shown in Section II.C, observing φ improves informed traders' estimation of the security value and resolves their uncertainty about the equilibrium price schedule. This makes the informed able to infer the exact impact of net order flows on the equilibrium price. The disclosure thus effectively enhances the position of informed traders in dealing with market makers and adversely affects the selection of market makers against the informed. Accordingly, market makers are prone to increase the sensitivity of prices to net order flows, and this tends to decrease market liquidity.

Second, the disclosure increases the intensity of information-based competition among informed traders. From expression (1) and (6), it is easy to show $\hat{\beta} > \beta$, *i.e.*, the intensity of informed trading increases due to the disclosure. In other words, informed traders compete more aggressively on their private information in response to the public disclosure, though signal ϕ becomes less informative ($\hat{I}_\phi < I_\phi$). The intensified competition weakens the collective position of informed traders in dealing with market makers and improves market makers' selection against the informed traders. Hence, market makers are prone to decrease the price sensitivity to net order flows due to the competition pressure in market making. As a result, market liquidity tends to increase.

Given the two effects working in the opposite directions, we need to identify the determinants of their relative magnitude in order to characterize the net impact of the disclosure. The following proposition provides the necessary and sufficient condition for the positive effect of the disclosure on market liquidity to dominate the negative effect. The proof is straightforward.

Proposition 1: *Under the assumptions of the current model,* $\hat{\lambda}^{-1} > \lambda^{-1}$ *if and only if*

$$\Delta \equiv 1 - \frac{(M + N - 1)^2}{(M - 2)^2 N^2} - I_\varphi I_\phi > 0, \tag{11}$$

where $0 < I_\varphi < 1,\ 0 < I_\phi \leq 1$. *In addition,* $\frac{\partial \Delta}{\partial M} > 0,\ \frac{\partial \Delta}{\partial N} > 0.$

Proposition 1 shows that the nature of the net impact of the disclosure on market liquidity depends upon the number of informed traders and the number of market makers for a given level of informativeness of each signal. In the model, the number of traders in each group measures the intensity of competition among traders in that group. Thus, the proposition virtually states that the net impact of the disclosure is dependent upon the intensity of competition in informed trading and in market making. Moreover, the comparative static analysis indicates that the disclosure tends to increase market liquidity in a market with more intense competition among market makers or among informed traders. This result can be intuitively explained by the tradeoff between the two opposite effects of the disclosure. As argued before, the disclosure of

market makers' pre-trade information has a positive effect on market liquidity through intensifying the information-based competition among informed traders and a negative effect by reducing relative informational strength of market makers. The competition effect is absent when private information is held monopolistically, but it is significant when the number of competing informed traders is large. The information effect, on the other hand, diminishes when the number of market makers is increasing, since the greater competition in market making weakens market makers' position in the first place. Therefore, the positive competition effect tends to be dominating when the competition in informed trading or in market making is intense and it tends be dominated when the intensity of competition is weak.

The impact of the disclosure on market liquidity also depends on the degree of informativeness of each signal, I_φ, I_ϕ. By Proposition 1, there are $\frac{\partial \Lambda}{\partial I_\phi} < 0$, $\frac{\partial \Lambda}{\partial I_\varphi} < 0$. That is, increasing informativeness of either signal tends to adversely affect the net impact of the disclosure on market liquidity. In other words, for a given level of competition, the disclosure works more in the direction to decrease market liquidity when a signal is more informative. This result can similarly be explained by the tradeoff between two opposite effects of the disclosure. When informed traders or market makers are well privately informed prior to trading, the disclosure of market makers' pre-trade information tends to become less effective in intensifying the competition among informed traders than in reducing market makers' informational strength. Thus, in the presence of more informative signals, a greater level of competition in informed trading or in market making is required for the disclosure to increase market liquidity.

Changes of the distribution of profits across three types of traders can be examined by comparing expression (3)-(5) with expression (8)-(10) in Section II. It is easy to show:

$$E[\hat{L}(\hat{X},\hat{Y})] - E[L(X,Y)] = (\hat{\lambda} - \lambda)\sigma_z^{\,2}$$

$$E[\hat{\Pi}^I(\hat{X},\hat{Y})] - E[\Pi^I(X,Y)] = \frac{M-2}{M+N-1}(\hat{\lambda} - \lambda)\sigma_z^{\,2}$$

$$E[\hat{\Pi}^M(\hat{X},\hat{Y})] - E[\Pi^M(X,Y)] = \frac{N+1}{M+N-1}(\hat{\lambda} - \lambda)\sigma_z^{\,2}.$$

These expressions show that given *M*, *N*, and $\sigma_z^{\,2}$ the change in the expected losses of uninformed traders as well as the changes in the expected profits of informed traders and market makers are inversely related to the change in market liquidity. This result, together with Proposition 1, leads to:

Proposition 2: *Under the assumptions of the current model, disclosure of market makers' pre-trade information will decrease the expected losses of uninformed traders as well as the expected profits of informed traders and market makers if and only if*

$$1 - \frac{(M+N-1)^2}{(M-2)^2 N^2} - I_\varphi I_\phi > 0,$$

where $0 < I_\varphi < 1,\ 0 < I_\phi \le 1.$

As shown in Proposition 2, the competition affects the changes of the distribution of profits across traders. The disclosure will reduce the expected losses of uninformed traders to informed traders and market makers only when the competition in both informed trading and market making is intense. This result, along with Proposition 1, will be reinforced by the

presence of discretionary uninformed traders, who can choose to trade in alternative markets and during different time periods. When the disclosure increases liquidity and decreases the expected costs of uninformed trading in a market, more discretionary uninformed traders enter the market for lower transaction costs. More concentrated uninformed trading makes the market more liquidity and thus reduces the cost of uninformed trading further.

In addition, the above results are not qualitatively affected by the entry or exit of market makers and informed traders. To illustrate, consider the entry or exit by market makers. Suppose the expected trading profits of each market maker in the equilibrium under no disclosure is equal to a "reservation value" R , *i.e.*,

$$E[\Pi_j^{MM}(X,Y)] = \frac{N+1}{M(M+N-1)}\lambda\sigma_z^{\,2} = R, \quad \text{j = 1, 2, …, } M.$$

If the competition in the market is sufficiently intense so that the inequality (11) holds, the disclosure results in $\hat{\lambda}^{-1} > \lambda^{-1}$ in the absence of the entry or exit. When the entry or exit by market makers is allowed, some market makers will exit the market because

$$E[\hat{\Pi}_j^{MM}(\hat{X},\hat{Y})] = \frac{N+1}{M(M+N-1)}\hat{\lambda}\sigma_z^{\,2} < R.$$

From expression (7) in Lemma 2, $\hat{\lambda}$ increases as M declines. That is, market liquidity (after the disclosure) will decrease as market makers exit the market. This in turn increases the expected profits of each market maker who remains in the market. The process will continue until the expected profits earned by each market maker rise back to the reservation value. Denote the number of remaining market makers as $\hat{M}$. In equilibrium we have

$$\frac{N+1}{\hat{M}(\hat{M}+N-1)}\hat{\lambda}\sigma_z^{\,2} = \frac{N+1}{M(M+N-1)}\lambda\sigma_z^{\,2}. \qquad (12)$$

In the last equation, since $\hat{M} < M$, $\hat{\lambda}^{-1} > \lambda^{-1}$.

From (3) and (8), $E[\hat{L}(\hat{X},\hat{Y})] > E[L(X,Y)]$.

From (5), (10), and (12):

$$E[\hat{\prod}^{MM}(\hat{X},\hat{Y})] = \frac{N+1}{\hat{M}+N-1}\hat{\lambda}\sigma_z^{\,2} = \frac{\hat{M}}{M}\cdot\frac{N+1}{M+N-1}\lambda\sigma_z^{\,2} < E[\prod^{MM}(X,Y)].$$

From (4), (9), and (12):

$$E[\hat{\prod}^{IT}(\hat{X},\hat{Y})] = \frac{\hat{M}-2}{\hat{M}+N-1}\hat{\lambda}\sigma_z^{\,2} = \frac{\hat{M}(\hat{M}-2)}{M(M-2)}\cdot\frac{M-2}{M+N-1}\lambda\sigma_z^{\,2} < E[\prod^{IT}(X,Y)].$$

Following the same procedure, we can show that our conclusion also holds when the entry or exit by informed traders is allowed.

IV. Conclusion

This article examines the possible changes of market characteristics as a result of disclosing information known to market makers prior to trading. In the model, a signal risky security is traded among three types of risk-neutral traders: privately informed traders, uninformed traders, and

market makers that possess pre-trade information from their exclusive access. The strategic interaction between informed traders and market makers and the competition among the participants within each group determines the characteristics of the market. It is shown that disclosure of market makers' pre-trade information weakens the relative informational strength of market makers but intensifies the information-based competition among informed traders. The net effect depends on the competition environment of the market. Specifically, the disclosure tends to increase market liquidity and decrease the trading losses of uninformed traders to the informed and market makers only when the competition in both informed trading and market making is intense.

Our results provide insights into the issue on market makers' exclusive informational accesses in theoretical perspective. But the results are by no means presenting the solution to the issue. In practice, market makers' informational accesses are differential and delicate. In some cases, implementing and reinforcing the policy or rule suggested in this study would be formidably difficult, if not impossible. Nevertheless, this study adds to our understanding of the relationship between the performance of securities markets and the information known to market makers. Further research needs to concentrate on specific informational accesses of market makers under different trading mechanisms.

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Dividend Stability and Firm Characteristics

John Consler, Greg M. Lepak and Susan F. Havranek

Abstract

Dividend stability is studied on 1,968 dividend paying firms using quarterly data from 2000 through 2005. Three groups are established: Group 1 (traditional) has firms that pay dividends every year which represents a stable dividend payment approach; Group 2 (irrelevance) has firms that stop paying dividends; and Group 3 (residual) pays dividends somewhat randomly (not annually). The residual policy group is the largest of the three groups and also is rewarded by investors with the highest growth rate in market to book value ratio in deciles. After investigating the underlying variables, it appears that larger firms tend to follow a traditional policy of stable dividends while smaller firms are more likely to follow a residual or irrelevance approach.

I. Introduction

The purpose of this study is to investigate the usage of the three major dividend theories by firms paying dividends from 2000 through 2005. The three theories of dividend policy studied are traditional or stable cash dividends, dividend irrelevance, and residual theory.

Brigham and Houston (2012), a popular finance textbook, describes traditional dividend theory as proposed by Gordon and Lintner. Investors prefer to receive current income in the form of dividends, rather than the potential of future income, through capital gains on a stock. An optimal dividend policy will raise market value of the firm and decrease cost of capital. Dividends do matter.

Dividend irrelevance theory as espoused by Miller and Modigliani is the direct opposite of the traditional viewpoint. Dividends do not matter. There is no optimum dividend policy; instead firms should re-invest net income into the company, and this will be reflected in capital gains growth. Investors decide when to sell their stock to capture income. Market value of stock and cost of capital are unrelated to dividend policy. There are tax advantages to this approach. It is always good to push taxes into the future where a dollar is worth less in an inflationary environment.

If one thinks of these two dividend theories, as opposite ends of a spectrum, in the real world the market moves back and forth between the two extreme positions. During the late 1990's bubble market, dividends were irrelevant to a great extent. In 2003 with the tax law change reducing taxes on dividends, coupled with a weak stock market, dividends mattered.

The third approach to dividend theory is the residual theory. From an academic viewpoint it is the best approach. Under pecking order theory, internal equity coming from net income should be used before selling more expensive new common stock to raise funds for projects. Net income is subject here under residual theory to two constraints: the optimal capital structure and the optimal capital budget. Whatever income remains (residual) is left over for common stock dividends. Because both net income and dollar value of new products will vary

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from year to year, the residual will also vary annually. Traditional theory says investors would not like this uncertainty of dividend pattern. However this approach would maximize the efficiency of the use of the net income and meet management's goal of maximizing stock price in the long run. This study will investigate the usage of these three different methods of dividend theory.

Nineteen hundred sixty-eight firms are divided into three groups using quarterly data to determine dividend payment pattern related to stability. Group 1 (traditional) is a stable pattern representing the traditional approach. Group 2 (irrelevance) is a stop payment pattern which represents dividend irrelevance. Group 3 (residual) is an intermittent approach to payments which represents residual theory.

Now that three groups have been established, representing three dividend theories, the purpose here is to investigate if degree of dividend stability for a firm has any relationship to growth rates of key firm characteristics: market to book value ratio, total assets, net income or loss, common shares outstanding, current ratio, and debt ratio. These variables have been chosen based upon results from three prior studies (Fama and French, 2001; Consler and Lepak, 2007; Havranek, Consler, and Lepak, 2009).

II. Literature Review

Fama and French (2001) provide the best study of firm characteristics relevant to dividends. These characteristics have changed over time (1978 to 1999), resulting in more small firms with low profitability and strong growth opportunities which are not likely to pay dividends. They also find, regardless of characteristics, firms have become less likely to pay dividends. Relevant variables for dividends proved to be profitability, investment opportunities, size, market value to book value, and share repurchase. This helps to determine which variables should be included in the current study.

Baker, Veit, and Powell (2001) found based on managers' responses the most important causes of dividend decisions are the pattern of past dividends, stability of earnings, and the level of current and expected future earnings. These factors were relevant for firms listed on both NASDAQ and the New York Stock Exchange. They also found great differences between financial versus non-financial firms. This study triggered the idea of looking at the relevance of dividend payment patterns for the current work.

Baker and Wurgler (2004) propose dividend decisions are driven by prevailing investor demand. Investor demand for dividends changes over time and firms react. They find non-payers tend to initiate dividends when demand is high. Payers tend to omit dividends when demand is low. Demand is based upon the relative stock price on dividend payers. Both past capital gains and future returns are part of the dividend model used. This is one of the reasons why the study here is limited to a short period of time when it was believed dividends should be important.

DeAngelo, DeAngelo, and Skinner (2004) build upon the work of Fama and French (2001). They find a concentration of dividends has occurred. Aggregate real dividends from

industrial firms increased over the past 20 years, even though the number of dividend payers has decreased by over 50%. Increased dividends from top payers overwhelm the slight dividend reduction from the loss of many small payers. The largest aggregate dividend payers in 2000 account for over 50% of all dividends paid by industrial firms. When looking at a sample for future work, it had best include these large, dominant, dividend payers to be relevant.

Chetty and Saez (2005) document a 20 percent increase in dividend payments by non-financial, non-utility publicly traded firms following the 2003 dividend tax cut. This should support an expectation of increasing dividends per share in the post-2000 period of the current study. This provides further proof that the study period of 2000 to 2005 should be an appropriate choice where dividends matter.

Consler and Lepak (2007) build upon Fama and French's (2001) earlier work. Different characteristics such as price, size, debt level, shares outstanding, and profits are found to vary by risk and dividend level for firms paying dividends. Appropriate variables are shown to be key characteristics necessary for use in this current study.

Havranek, Consler, and Lepak (2009) show that dividends per share declined prior to 2000 and increased thereafter. The market break of 2000 appears to have changed how investors perceive dividends. Firms responded by increasing dividends per share. The tax change in 2003 most likely helped to continue the increase in dividends per share. Dividends appear to be more important during the post-2000 period. Market/book value, size of assets, number of shares outstanding and debt ratio are all significant variables related to dividends per share in both periods of the study. Net profit is only significant after 2000. These results helped determine both the relevant time period and variables for the current work.

This current study builds upon this prior supporting work. The foundation has been laid to now investigate how dividend theory is related to these important firm characteristics.

III. Sample and Data

Firms that declared cash dividends, excluding payments made as liquidations, acquisitions or reorganizations, during the period 1/1/2000 to 12/31/2005 were identified in CRSP. This yielded a total of 24 quarters of data on 1,968 firms with 24,272 observations. The short time period attempts to limit the study's focus on those years after the 2000 market break where dividends should have importance. The down market and 2003 tax decrease on dividends both support this view. This should be a fertile period to study dividend stability patterns.

The firms are separated into three groups based upon cash dividend pattern. Group 1 (traditional) with 792 firms (17123 observations) is the stable pattern: firms that consistently pay a dividend at least once a year throughout the study period (each firm has 24 data points). Group 2 (irrelevance) with 358 firms (2096 observations) is the stop pattern: firms that start off by paying a dividend at least once a year, but stop paying before the final year of the study period (each firm has at least 1 data point). Group 3 (residual) with 818 firms (5053 observations) is the intermittent pattern: all firms that paid at least one dividend during the study period but do not meet the criteria for Groups 1 or 2 (each firm has at least 2 data points).

Quarterly data were obtained on several financial variables at all measurement occasions for which a dividend was paid: common shares outstanding (millions shares), closing price per share in third month of quarter ($ per share), total stockholders' equity (millions $), total assets (millions $), total liabilities (millions $), net income/loss (millions $), total current assets (millions $), total current liabilities (millions $), and monthly high and low stock prices. Some ratios that were calculated include book value per share (total stockholders' equity ÷ common shares outstanding), market to book value ratio (average price per share ÷ book value per share), debt ratio (total liabilities ÷ total assets), and current liquidity measure (total current assets ÷ total current liabilities).

IV. Model

In longitudinal research settings, the objective is to characterize patterns of response and change over time while analyzing the effects of covariates on these patterns. With applications involving financial data, repeated observations on each firm will be correlated and not independent. This dependency must be considered to correctly model the relationship between a response variable and selected covariates in regression applications. Linear mixed-effects models (see, for example, Pinheiro and Bates, 2000) are very appealing in such applications: (1) they generally result in a very flexible and parsimonious covariance structure for measurements repeated over time and (2) they can accommodate unbalanced longitudinal data (i.e., the number of observations on each firm can be different and the observations do not have to be obtained at the same measurement occasions).

We use a linear mixed-effects model to analyze the unbalanced financial data collected for this study. In particular, the model for selected response variable Y_{ij} for the ith firm at time t_{ij}, $j = 1, \ldots, n_i$, can be expressed as

$$E(Y_{ij} \mid b_i) = (\beta_0 + \alpha_{02}\text{Group2}_i + \alpha_{03}\text{Group3}_i + b_{0i}) + (\beta_1 + \alpha_{12}\text{Group2}_i + \alpha_{13}\text{Group3}_i + b_{1i})\, t_{ij} + \varepsilon_{ij}. \quad (1)$$

For this representation, Group2_i (irrelevance) = 1 if the ith firm stops paying dividends, zero otherwise; Group3_i (residual) = 1 if the ith firm pays dividends intermittently, zero otherwise. The regression coefficients are defined as follows: β_0 and β_1 are the population average intercept and average slope for firms that have the traditional dividend pattern, respectively; α_{0k} is the average difference in intercept between firms in Group k and firms in Group 1 (traditional); α_{1k} is the average difference in slope between firms in Group k and firms in Group 1. The vector containing the random effects b_{0i} and b_{1i} is assumed to follow a multivariate normal distribution with the zero vector as mean and unknown covariance matrix $\boldsymbol{D}$; and the ε_{ij} is the independent (within-firm) normally distributed measurement error with mean zero and variance σ^2. The within-firm error is assumed to be independent of the random effects.

This model is used to estimate fixed effects that are common to all firms, and random effects that are specific to individual firms over time. The random effects reflect heterogeneity across firms in the regression coefficients thereby resulting in correlation between observations from the same firm, i.e. the individual observations from firm i are correlated since they share a common intercept ($\beta_0 + b_{0i}$) and a common slope ($\beta_1 + b_{1i}$). In the case of random intercepts and

slopes, the induced covariance between Y_{ij} and Y_{ik} can be expressed as a function of time. As mentioned above, this covariance structure can be described with a relatively small number of parameters, regardless of the number and timing of the observations.

In this study, firms within each group have different numbers of repeated observations as well as different measurement times on several variables that have been shown to be of scientific interest in research on dividends. It is evident that the model in (1) is particularly well suited for analyzing unbalanced financial data collected over time, as is the case when studying dividend patterns where different firms can have unique sequences of dividend payments. For each selected response variable, our substantive focus is on the difference in slope (growth rate) between the three dividend paying groups. To address non-normality in some of the data a log transformation is performed on the values for the following variables: dividends per share, total assets, common shares outstanding, and debt ratio. The calculated values for market to book, current liquidity, and net income were assigned to deciles to limit the effect of non-normality, negative values, and outliers. For convenience of representation, the following abbreviations denote the transformed data: DPS = log(dividends per share + 1), ASSETS = log(total assets), SHARES = log(common shares outstanding + 1), DEBT = log(debt ratio + 1), MARKET = decile ratings of market to book value ratio, LIQUIDITY = decile ratings of current liquidity, and PROFIT = decile ratings of net income.

V. Analysis and Results

Table 1 presents the estimated results for the seven regressions run for the three groups for each response variable using restricted maximum likelihood estimation. The Hausman (1978) specification test confirmed the need for random intercepts and random slopes in the fitted mixed-effects models in Table 1.

Regression 1 for log dividends per share (DPS) shows there is no significant difference in growth rates between Group 1 (traditional) and Group 2 (irrelevance). The growth rate for Group 3 (residual) is significantly higher than the growth rate for both Group 1 (traditional) and Group 2 (irrelevance). Perhaps this can be explained if Group 3 (residual) has better investment opportunities than the other two groups and uses the residual theory approach to dividend payments. Years where good investment opportunities exist would result in no earnings being left over for dividend payments (Fama and French, 2001).

Group 3 represents the highest growth rate in log dividends per share, yet it does not follow a stable dividend payment pattern. Traditional dividend theory is not supported by these results in the sense that there is more uncertainty present in Group 3 than in Group 1. If dividends matter as much as traditional theory expects, why is Group 3 the largest of the three groups with its intermittent payment pattern? One might have expected Group 1 to be the largest group. So one could conclude, dividends matter, but they do not have to be as stable as theory would expect. Of firms that paid dividends over the study period it is found that most pay intermittently or stop paying.

The results for log total assets (ASSETS) are given in Regression 2, which shows that the growth rate for Group 3 is significantly higher than the growth rate for Group 1. The growth rate

for Group 1 is also significantly higher than Group 2's rate. This rapid growth rate in log total assets for Group 3 supports the possibility that member firms have better investment opportunities than do the other two groups. It is noteworthy that an analysis of the raw (untransformed) data on total assets shows that there is no significant difference between the mean response for Group 2 and Group 3, with means calculated over all firms and time points in each respective group. However, mean assets for Group 1 are significantly higher than mean assets for both Group 2 and Group 3. Group 1 has mean assets of $7566.4 million while Group 2 has $4175.0 million and Group 3 has $5386.8 million, which shows that Group 2 firms are 55% and Group 3 firms are 71% the size of Group 1 firms. Thus, large firms appear to be more likely to follow a traditional stable dividend policy than smaller firms.

Table 1
Mixed-Effects Model Estimation Results

	(1) DPS		(2) ASSETS		(3) MARKET		(4) SHARES	
	Coef (SE)	p-val	Coef (SE)	p-val	Coef (SE)	p-val	Coef (SE)	p-val
Fixed								
β_0	.15(.001)	<.00	7.18(.07)	<.00	5.16(.12)	<.00	3.98(.06)	<.00
β_1	.00(.00)	<.00	.02(.00)	<.00	.04(.01)	<.00	.01(.00)	<.00
α_{02}	.01(.01)	.71	-.47(.13)	.00	-1.14(.21)	<.00	-.57(.10)	<.00
α_{03}	.04(.01)	.00	-.73(.10)	<.00	-1.21(.19)	<.00	-.45(.08)	<.00
α_{12}	.00(.00)	.16	-.01(.00)	.00	-.02(.01)	.09	-.00(.00)	.07
α_{13}	.00(.00)	<.00	.01(.00)	<.00	.052(.01)	<.00	.01(.00)	.00
α_{13}-α_{12}		<.00		<.00		<.00		.00
Random								
D matrix	.04 .00 .00 .00		4.02 -.01 -.01 .00		10.18 -.26 -.26 .02		2.56 -.01 -.01 .00	
Var(ε_{ij})	.01		.01		1.10		.01	
	(5) DEBT		(6) PROFIT		(7) LIQUIDITY			
	Coef (SE)	p-val	Coef (SE)	p-val	Coef (SE)	p-val		
Fixed								
β_0	.43(.01)	<.00	5.34(.08)	<.00	5.25(.11)	<.00		
β_1	-.00(.00)	.09	.03(.00)	<.00	.02(.00)	<.00		
α_{02}	.03(.01)	.01	-.86(.16)	<.00	-.01(.20)	.96		
α_{03}	-.04(.01)	<.00	-1.17(.16)	<.00	.74(.18)	<.00		
α_{12}	.00(.00)	.00	-.11(.01)	<.00	-.03(.01)	.00		
α_{13}	.00(.00)	.01	.04(.01)	<.00	-.03(.01)	<.00		
α_{13}-α_{12}		.12		<.00		.87		
Random								
D matrix	.03 -.00 -.00 .00		5.11 -.03 -.03 .01		9.25 -.15 -.15 .01			
Var(ε_{ij})	.00		2.76		.86			

Regression 3 for the decile ratings of the market value to book value ratio (MARKET) finds there is no significant difference in growth rates between Group 1 and Group 2. More importantly, Group 3 has a growth rate significantly higher than both of the other two groups. This might reflect investors' recognition of a brighter future for Group 3 firms. The higher valuation probably results from greater investment opportunities compared to the other two groups. An analysis of the original (untransformed) market to book value ratio shows that there is no significant difference between the mean response for Group 1 and Group 3, where both means are significantly higher than the mean for Group 2. This implies that investors are rewarding both groups that continue to pay dividends, no matter what the payment approach is, traditional or residual.

The mixed-effects model estimates for log total common shares outstanding (SHARES) in Regression 4 show there is no significant difference in growth rate between Group 1 and Group 2. The growth rate for Group 3 is significantly higher than that of both Group 1 and Group 2. Perhaps log shares in Group 3 are growing so quickly due to large capital needs. This could be because of more investment opportunities than the other two groups. Certainly this growth would be consistent with such a hypothesis.

The log debt ratio (DEBT) is the response variable analyzed in Regression 5. Findings show that there is no significant difference in growth rate between Group 2 and Group 3. Both of these groups have a growth rate significantly higher than the growth rate of Group 1. Group 1 with a stable dividend payment pattern may have the lowest investment opportunities and therefore needs less debt. Group 3 may have greater capital needs which are logically financed by the cheapest capital component, debt, as much as possible. Group 2 stops dividend payments either because of great investment opportunities or more likely because of low opportunities resulting in low profits.

Regression 6 for the decile ratings of net income (PROFIT) shows that the growth rate for Group 1 is significantly higher than the growth rate for Group 2. Also, the growth rate for Group 3 is significantly higher than the growth rate for Group 1. This is as one would expect, if the theme of greater investment opportunities for Group 3 holds. Higher growth in profits as measured by net income is a reasonable result.

The final regression we consider is for decile ratings of the current ratio (LIQUIDITY). Regression 7 shows that there is no significant difference in growth rate between Group 2 and Group 3. The growth rate for Group 1 is significantly higher than that for both Group 2 and Group 3. Perhaps Group 1 has lower investment opportunities and therefore does not use current assets as efficiently as do the other two groups. One might expect the higher the capital needs of a firm, the lower its liquidity as measured by the current ratio.

VI. Conclusions

Having looked at the individual variable regressions from Table 1, now an overview is appropriate. Group 1 (traditional) represents those firms that follow a stable payment pattern that traditional theory says should be valued most highly (Brigham and Houston, 2012). Investors like certainty over uncertainty. A bird in the hand is worth two in the bush. However,

here Group 3 (residual) which represents an intermittent payment pattern has the highest growth rate in market to book value ratio in deciles. One also might expect Group 1 (traditional) to be the majority of firms in the study. That turns out not to be the case. Group 3 (residual) is the largest group. More firms are following a residual approach than a traditional approach to dividend payments.

Group 3 (residual) has the highest growth rate for all variables except for log debt ratio and decile ratings of the current ratio. As previously explained, this is consistent with Group 3 having greater investment opportunities than the other two groups and with it following some type of residual approach to paying dividends. In textbooks, residual approach is called best in theory, but should only be practiced by firms for long run planning. This study supports the idea that more firms are applying the residual approach in the short term, and investors are rewarding them with the highest growth rate in decile ratings of market to book value ratio.

Further investigation found that Group 2 (irrelevance) firms are 55% and Group 3 (residual) firms are 71% the size of Group 1 (traditional) firms. Only somewhat smaller firms are using the residual and dividend irrelevance approaches. Larger firms are still following a stable traditional approach. Finally, both groups paying dividends are being rewarded by investors with higher market to book value ratios over the group that stopped paying dividends.

Future work could concentrate on which industries tend to fall into which of the three study groups. Could industry affiliation help to explain the stability of dividend payments? Do some industries tend to follow the short term residual approach to dividends more than others?

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Stock Portfolio Returns, Autocorrelations, and Nonsynchronous Trading

Rakesh Bharati, Susan J. Crain, and Manu Gupta

Abstract

Short-horizon portfolio return autocorrelation is often attributed to nonsynchronous trading. Nonsynchronous trading arises as last trades of most stocks occur randomly before the market close. However, prominent studies cast doubt on whether it can entirely explain the observed magnitude of index autocorrelation. We study if there is a market wide component to nonsynchronous trading, as it is often viewed as idiosyncratic to a stock. The results indicate that there is a significant market-wide factor and all stocks are sensitive to this factor. Further, higher size decile stocks are far more sensitive to the market-wide factor than lower size deciles. Theoretical models also imply that portfolio return autocorrelation should increase in lagged dispersion in last trade time; but we find no such sensitivity for equally and value weighted portfolios. Similar to the known relationship between stock price changes and volume, we find reliable evidence that longer trading days garner positive returns while shorter trading days yield negative or zero returns.

I. Introduction

Significant, positive portfolio autocorrelation in the short horizon has been a persistent anomaly since Cowles and Jones (1937). Since then, many studies have documented positive portfolio autocorrelations for stocks as well as other asset classes [e.g., see Khandani and Lo (2011) for evidence on emerging market stocks, corporate bonds, and mortgage-backed securities]. Fisher (1966) proposed that nonsynchronous trading (or nontrading) was the cause of this observed autocorrelation. The phenomenon occurs because all stocks do not last-trade exactly at 4:00 pm EST (the official close of the US markets). While there is some empirical support for Fisher's nonsynchronous trading based explanation [e.g., Boudoukh, Richardson, and Whitelaw (1994) and Ahn, Boudoukh, Richardson, and Whitelaw (2002)], several studies show that nonsynchronous trading only explains a small fraction of the observed magnitudes of autocorrelations [e.g., Perry (1985), Atchison, Butler and Simonds (1987), Lo and MacKinlay (1990), and Kadlec and Patterson (1999)]. Nevertheless, a variety of quantitative methods have been developed to minimize the impact of these autocorrelations in portfolio/index return parameter estimates [e.g., Hayashi and Yoshida (2005), Christensen, Kinnebrock and Podolskij (2010), and Griffin and Oomen (2011)]. These estimators risk discarding valuable information in autocorrelations if the autocorrelations have economically meaningful causes [e.g., Hou (2007)].

Alternative explanations of the autocorrelation are considered marginal. For example, time variation in expected returns due to a changing investment opportunity set can only be low-frequency and thus is not a credible explanation [see Boudoukh, Richardson, and Whitelaw (1994)]. Using index futures data, Ahn, Boudoukh, Richardson, and Whitelaw (2002) reject the bid-ask bounce as a cause since autocorrelation-implied bid-ask spreads are nearly ten times the actual spreads. Stock price discreteness, along with non-normality of returns, is ruled out as the cause by Kadlec and Patterson (1999). Therefore a deeper understanding of the anomaly is important as the observed autocorrelations appear to contradict the efficient markets hypothesis.

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Availability of trade-by-trade data permits us to study the pattern of last trade time across stocks and see if it affects the serial correlations in two widely studied portfolios (equally-weighted and value-weighted market indices). First, using actual time stamps, we test if nonsynchronous trading is indeed idiosyncratic to a stock as presumed by most studies. Second, we test if the dispersion in last trade time predicts the level of serial correlation in the next-day return, as required by theoretical models. Finally, we investigate if mean last trade time is correlated with index returns. As Campbell, Grossman, and Wang (1993) note, "…volume tends to be higher when stock prices are increasing than when prices are falling." One should expect similar results with the mean trade time as, on high volume days, most stocks trade closer to the end of the day.

Except Kadlec and Patterson (1999), this is the only study to our knowledge to use the actual last trade time data to explore nonsynchronous trading. Unlike Kadlec and Patterson (1999), we use more recent data from a period that is twice as long. Further, while Kadlec and Patterson merely permit last trade time to be correlated across a group of securities in their simulation, we directly test if there is a market wide factor to nonsynchronous trading. To accomplish this goal, we characterize the distribution of the last time of trade across stocks with two market-wide measures where the first can be understood as the mean last trade time and the second is the dispersion in last trade time.

Our key result is that last trade time is positively correlated across stocks. This supports the presence of a systematic factor which causes stocks to last trade later or sooner. Thus, models of nonsynchronous trading need to assume a market wide factor affecting nonsynchronous trading. Further, a theoretical prediction is that thinner trading should lead to higher serial correlations [see, for example, Campbell, Lo, and MacKinlay (1997)]. We test this proposition by using the last trade time dispersion across the market as a proxy for thin trading and find that the thinness of trading does not seem to affect the strength of the serial correlation in equally and value weighted market portfolios. Finally, analogous to price-volume studies, we find that index returns are positively associated with the length of the trading day and those days with smaller mean last trade time have low or even negative index returns.

The paper is organized as follows. Section II presents a brief review of the literature. Section III discusses our data, methodology, and hypotheses. Section IV presents the results and section V concludes.

II. Literature Review

The fact that the close of the market is often not the time of the last trade for stocks was first analyzed by Fisher (1966). Subsequently, Perry (1985) showed that a large stock portfolio has an increase in serial correlation upon inclusion of additional securities, thus indicating that serial correlation is not merely an artifact of nonsynchronous trading. Atchison, Butler, and Simonds (1987) use the Scholes-Williams (1977) model to derive a theoretical value for portfolio autocorrelation and conclude that the empirically obtained values are well beyond what is attributable to nonsynchronous trading. Lo and MacKinlay (1990) also find that nonsynchronous trading does not explain a large fraction of the observed autocorrelations.

Boudoukh, Richardson, and Whitelaw (1994) allow for the heterogeneity of betas and nonsynchronous trading probabilities, as well as time dependence of nonsynchronous trading – issues not addressed by Lo and MacKinlay (1990). They show that, under such conditions, nonsynchronous trading can lead to comparatively larger autocorrelations than what was earlier predicted by Lo and MacKinlay (1990). In response, Kadlec and Patterson (1999) use five years of transactional data to obtain the last trade time for the securities to endogenize across-security correlation in nontrading intervals, time dependence and heterogeneity of trading, and difference in betas. They find autocorrelations in daily and weekly returns of large, small, and randomly selected stock portfolios to be larger than the simulated values.

Ahn, Boudoukh, Richardson, and Whitelaw (2002) find that index futures return autocorrelations are close to zero while the spot index return autocorrelations are expectedly positive. Further, the difference in the autocorrelations between the spot index returns and the index futures returns does not depend on transaction costs, according to their model. Thus, they claim support for the nonsynchronous trading based explanation. Clearly further explorations are necessary as the weight of the evidence suggests that a large part of return autocorrelation remains unexplained.

III. Data, Methodology, and Key Hypotheses

In selecting the period for the data, our goal is to select a long time series that is relatively free of regime shifts. The recent decade has seen momentous changes in the way securities are traded in the USA. Electronic Communications Networks (ECNs), offering faster trades, have lured institutional investors away from exchanges giving rise to a loss of liquidity. Market fragmentation due to ECNs, prominent users of ECNs (program and high-frequency traders), and dark pools (unregulated trading networks) are often quoted as new challenges for the markets.[1] Easley, Lopez de Prado, and O'Hara (2011) find pull-back of individual investors along with a reduction and concentration in liquidity providers, coupled with high-frequency trading, to be a major cause for the flash crash of May 6, 2010. The financial crisis of 2008 similarly created another externality. Other crucial changes include decimalization, Regulation SHO relaxing the long-existing regulations on short selling, and Regulation FD prohibiting selective disclosure of material information. Since these changes occurred at various time-points and their impact has been felt increasingly over time, it is not possible to choose a clear cut-off date without significantly reducing the sample. Still, it would be best to minimize the adverse impact of these changes on our estimates. In order to select a relatively uniform set of regimes, we cut off our sample at the end of the year 2002. Consequently, we sampled the Trades and Quotes Data (TAQ), from January 1993 through December 2002, to obtain the last trade time for listed securities on the New York Stock Exchange, American Stock Exchange and NASDAQ. In addition, we obtain the value- and equally-weighted index returns, volume, and turnover related information from the Center of Research in Security Prices (CRSP) database.

During 1993-2002, the market close was 4:00 PM EST and the open was 9:30 AM. The last trade and its time stamp are obtained from the TAQ data base. If no trade was found

[1] As Philips (2012) reports in a Businessweek on-line article, NYSE share of trade volume has gradually dropped from nearly 80 percent in the late 1990s to 22 percent in the early part of 2012. He attributes this decline to the emergence of competing ECNs and dark pools.

between 9:30 AM and 4 PM, no last trade time was recorded.[2] We converted the last trade time into a fraction of the trading day as shown below. A logit transformation of the fraction provides the last trade time measure (LTTM) for each security.

$$LTTM_{it} = \ln\left(\frac{x_{it}}{1 - x_{it}}\right) \quad (1)$$

where $x_{it} = \frac{Time\ in\ seconds\ from\ 9{:}30\ AM\ to\ the\ last\ trade\ for\ stock\ i\ on\ day\ t}{Total\ Number\ of\ Seconds\ between\ 9{:}30\ AM\ and\ 4{:}00\ PM}$

The logit transformation has desirable distributional properties, unlike the proportion which runs from zero to one. Finally, for each daily cross-section, we compute two statistics on LTTM across all available stocks – mean of the last trade time measure and the dispersion of the last trade time measure.[3] These two statistics essentially provide us with measures of market-wide nonsynchronous trading.

$$MLTTM_t = \frac{1}{N}\sum_{i=1}^{N} LTTM_{it} \quad (2)$$

$$DLTTM_t = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(LTTM_{it} - MLTTM_t)^2} \quad (3)$$

These two time series are used to test three hypotheses. The first hypothesis is a direct test of the common assumption in nonsynchronous trading models that nontrading probabilities are expected to be independent across stocks [for example, Lo and MacKinlay (1990)]. While it is a mathematically convenient assumption, there is no direct evidence on this crucial issue to date.

H1: The last trade time of individual stocks is independent of mean last trade time (MLTTM).

Next, we know that return autocorrelation is higher for the small-stock dominated equally-weighted market index compared to the value-weighted market index [see, for example, Atchison, Butler, and Simonds (1987)]. Small stocks tend to close much sooner than large stocks which we propose could be measured by the dispersion in the last trade time. Based on this reasoning, we should observe two patterns in data. First as noted above, we should observe lower serial correlation in the NYSE/AMEX/NASDAQ value-weighted portfolio while the NYSE/AMEX/NASDAQ equally-weighted portfolio should show strong positive serial correlation. Also, days with high dispersion in last trade time should demonstrate higher forward serial correlation. Days with low dispersion in last trade time, on the other hand, should have lower forward serial correlation as all stocks have nearly captured the same information, thereby reducing the predictability of the next day return using the previous day index return. This reasoning provides us with our second hypothesis.

[2] We dropped all dates when the market closed before 4 PM (26 days).

[3] McInish and Wood (1986) proxy thin trading by a similar variable based on the mean last trade time to market close in their comparison of beta adjustment techniques. Dimson and Marsh (1983) similarly employ a measure of trading infrequency with monthly returns to develop an adjustment to the systematic risk.

H2: Forward index return serial correlation should increase in dispersion in last trade time (DLTTM).

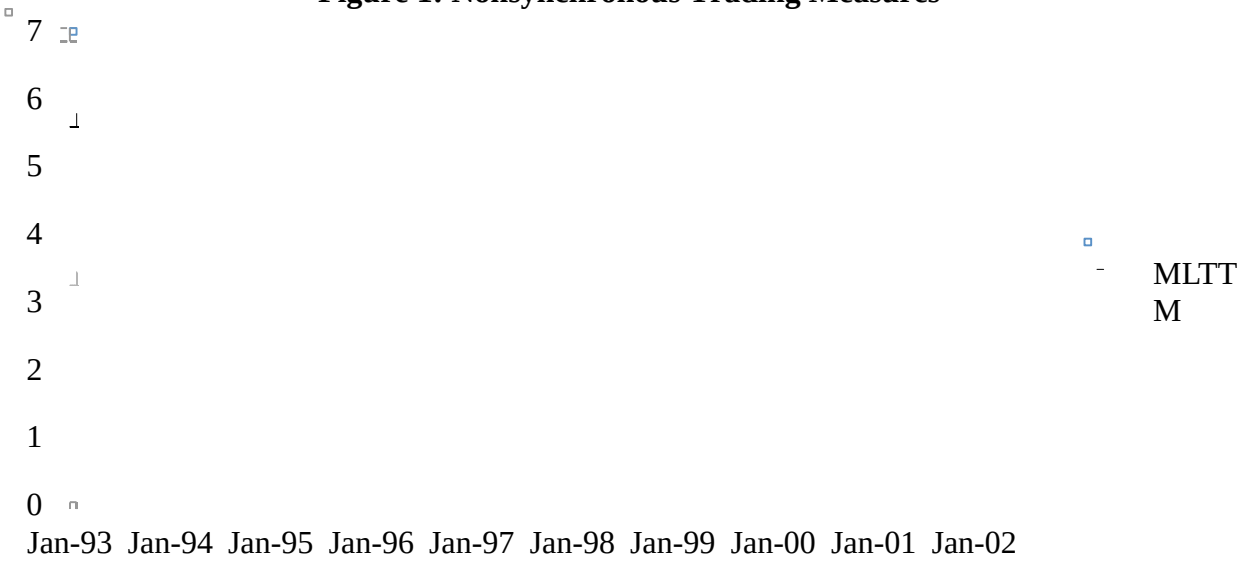
The third hypothesis is based on the intuitive similarities between our mean last trade time measure and the trading volume. Thus, days with later mean last trade time should demonstrate higher positive returns, compared to earlier mean last trade time days.

H3: Index return will increase in mean last trade time (MLTTM).

IV. Results

Figure 1 plots the values of the two measures, MLTTM and DLTTM.

Figure 1: Nonsynchronous Trading Measures



The mean last trade time and its dispersion rise over time indicating that stocks continue to trade later into the trading day, but last trade time dispersion also rises over time. Also, both time series show considerable variation.[4] As MLTTM appears intuitively similar to the volume related variables, we computed four market-wide volume proxies – average volume, average adjusted volume, average dollar volume and average turnover. We found them to only explain 15 percent of the total variation in our MLTTM measure.[5] Therefore, MLTTM appears to capture another dimension of market liquidity, of which the above four are also proxies. We now investigate if the mean last trade time measure is systematically associated with the last trade times across individual stocks.

The first hypothesis (H1) of idiosyncratic nonsynchronous trading implies that the Last Time to Trade Measure for a security (LTTM) and Mean Last Time to Trade Measure across securities (MLTTM) must be independent. We difference the two time series to obtain the

[4] We checked for changes in the two measures MLTTM and DLTTM immediately around the periods of change in the minimum tick size and found no significant difference. Therefore, tick size changes from 1/8th to 1/16th of a dollar and decimalization do not appear to have an impact on our measures, at least in the short term.

[5] Detailed descriptive statistics are available from the authors upon request.

change in the Last Trade Time Measure over its lag for the security and for the market. The resulting stationarity in the two time series helps minimize the probability of finding spurious correlations. We then regress the differenced LTTM (ΔLTTM) for each security on the differenced MLTTM (ΔMLTTM) and expect to find a coefficient of zero, consistent with H1. Table 1 reports average coefficients and proportions of positive and significant coefficients for Equation 4 by size deciles (as size is often a proxy for liquidity).

Table I
Regressions of Differenced Last Time to Trade Measure for each security (ΔLTTM) on the Differenced Mean Last Time to Trade Measure across securities (ΔMLTTM) by Size Deciles
$$\Delta LTTM = \beta_0 + \beta_1 \Delta MLTTM + \varepsilon$$

Size Decile	Proportion of stocks with positive β_1			Average β_1
		Significant at 95%	Significant at 90%	
Lowest	0.74	0.27	0.33	0.77
2	0.81	0.31	0.39	0.79
3	0.84	0.38	0.44	0.84
4	0.87	0.40	0.48	0.93
5	0.89	0.49	0.57	1.03
6	0.90	0.53	0.61	1.09
7	0.92	0.61	0.67	1.20
8	0.92	0.65	0.70	1.27
9	0.93	0.63	0.68	1.12
Highest	0.92	0.52	0.59	0.76

We fail to find support for the hypothesis of idiosyncratic nonsynchronous trading (H1) as there is a positive relationship between ΔLTTM and ΔMLTTM across deciles, indicating that there is a market-wide component to nonsynchronous trading. For example, 73.81% of the regressions at the lowest decile yielded positive coefficients and 33.46% (27.02%) were significant at the 90% (95%) confidence level. The average slope coefficient (β_1) on ΔMLTTM is 0.77 for the first decile. Moving up the size deciles, the proportion of positive slope coefficients, the proportion of significant coefficients, and the average value of the coefficients all monotonically increase. The peak occurs at the 8th decile where 65.34% of all regression coefficients are positive and significant at the 95% confidence level and the average slope coefficient is 1.27. Over 92% of all regression coefficients are positive.

Large stocks (5th decile and above) tend to be far more sensitive to this factor than small stocks. Interestingly, there is a decline in significances and average coefficient values as we move to the 9th and 10th deciles, with a large drop in the average β_1 for the highest decile. This may be due to the market-on-close orders related to S&P 500 index trading. Overall we find pervasive evidence of correlated last trade times across stocks, suggesting that nonsynchronous trading, at least in part, is driven by a market-wide phenomenon (perhaps arrival of economy wide information). This contradicts the typical assumption of idiosyncratic nonsynchronous trading, and lends support to the critique of Boudoukh, Richardson and Whitelaw (1994).

Dispersion in the Last Trade Time and Forward Index Return Correlation

As discussed earlier, models of nonsynchronous trading indicate that previous day trade time dispersion should lead to greater serial correlation in the next day index return (H2). This explains the high observed index return autocorrelation in the equally weighted index, while the correlation is nearly zero for the value weighted index (as larger stocks trade more frequently) [e.g., Perry (1985) and Atchison, Butler, and Simonds (1987)]. To test the second hypothesis, we assign each trading day into one of five groupings based on the dispersion in the last trade time (DLTTM) with the lowest dispersion days in the first quintile and the highest dispersion days in the fifth quintile. Thus as we move from the first to the fifth quintile, the sample has progressively higher dispersion in the last trade times. Next, we study the forward serial correlation of index returns. In other words, if the quintile assignment is made with the dispersion on day 0, the correlation between day 0 and day 1 is studied.

Table II presents serial correlation in value and equally weighted portfolio returns based on the sort by lagged dispersion in last trade time (DLTTM). The dispersion in the last trade time has risen over time. So, without an adjustment, we will simply end up with a sort where most recent data will be concentrated in the 5th quintile while the older data will fall in smaller quintiles. To counter this time trend, we adopt three different strategies. First, we perform a quintile sort within each calendar year and then merge the like quintiles across years. Second, we subtract the previous twenty-day average of DLTTM from the current value to eliminate the time trend. Third, we simply subtract the lagged value of DLTTM from the current value to eliminate the time trend.

Table II
Forward Serial Correlation in Value and Equally Weighted Index Returns for Quintiles formed on the Lagged Dispersion in the Nonsynchronous Trading Factor (DLTTM)

Quintile	$DLTTM_{t-1}$ sort by year			$DLTTM_{t-1} - SDLTTM_{t-i}/20$ where i = 2, 21			$DLTTM_{t-1} - DLTTM_{t-2}$		
	$r_{t,t-1}$	p-value	R^2	$r_{t,t-1}$	p-value	R^2	$r_{t,t-1}$	p-value	R^2
Value-weighted Index Returns (Unconditional r = 0.04)									
1	-0.03	0.41	0.00	-0.09	0.05	0.01	-0.03	0.50	0.0
2	-0.04	0.38	0.00	0.09	0.05	0.01	0.05	0.25	0.0
3	0.11	0.04	0.01	0.05	0.28	0.00	0.04	0.37	0.0
4	0.18	<.00	0.03	0.09	0.04	0.01	0.17	0.00	0.03
5	0.09	0.06	0.01	0.10	0.03	0.01	0.05	0.37	0.00
Equally-weighted Index Returns (Unconditional r = 0.23)									
1	0.21	<.00	0.06	0.17	<.00	0.04	0.24	<.00	0.08
2	0.23	<.00	0.05	0.36	<.00	0.11	0.26	<.00	0.07
3	0.27	<.00	0.06	0.25	<.00	0.05	0.21	<.00	0.04
4	0.36	<.00	0.11	0.22	<.00	0.05	0.36	<.00	0.12
5	0.21	<.00	0.04	0.28	<.00	0.07	0.15	0.01	0.01

Across all three methodologies, the equally weighted portfolio return correlations are generally positive and significant. However, value weighted quintiles generally present

insignificant correlations. This is to be expected for the two indices and has been documented in extant literature. However, going from the highest dispersion to lowest dispersion quintile for the equally weighted portfolio, there does not appear to be a systematic decline in correlation for all three methodologies, as one would expect under the second hypothesis. For the value weighted index, the correlation values for the bottom quintile are negative, while the higher quintiles generally have positive return correlations. However, most of these correlations are not significantly different from zero at the 95% confidence level. Thus our analysis fails to find support for the second hypothesis (H2).

Nonsynchronous Trading and Index Returns

We now test our third hypothesis (H3) that index returns are increasing in mean last trade time (MLTTM), similar to volume. In order to do so, we first sort trading days by mean last trade time. The upward trend of the MLTTM is handled in the same manner as was done for DLTTM above. Across the five quintiles, in Table III, we present the median return, the mean return and the p-value of the null hypothesis of the mean being equal to zero for the two indices.

Table III
Value and Equally Weighted Index Returns for Quintiles formed on Mean Last Trade Time Measure (MLTTM)

Quintile	$MLTTM_{t-1}$ sort by year			$MLTTM_{t-1}$ - $SMLTTM_{t-i}/20$ where i = 2, 21)			$MLTTM_{t-1}$ - $MLTTM_{t-2}$		
	Median	Mean	p-val	Median	Mean	p-val	Median	Mean	p-val
Value-weighted Index Returns									
1	-0.07%	-0.16%	0.00	-0.09%	-0.14%	0.00	-0.08%	-0.13%	0.00
2	0.01%	-0.04%	0.37	0.07%	-0.02%	0.57	-0.03%	0.01%	0.91
3	0.10%	0.09%	0.07	0.10%	0.11%	0.03	0.09%	0.06%	0.23
4	0.21%	0.13%	0.01	0.11%	0.11%	0.03	0.21%	0.13%	0.01
5	0.18%	0.18%	0.00	0.24%	0.15%	0.02	0.21%	0.15%	0.01
Equally-weighted Index Returns									
1	0.04%	-0.04%	0.11	0.02%	-0.04%	0.15	0.04%	-0.02%	0.47
2	0.11%	0.04%	0.24	0.15%	0.05%	0.09	0.11%	0.09%	0.01
3	0.19%	0.10%	0.00	0.20%	0.12%	0.00	0.20%	0.10%	0.01
4	0.28%	0.17%	0.00	0.28%	0.20%	0.00	0.26%	0.19%	0.00
5	0.34%	0.24%	0.00	0.29%	0.16%	0.00	0.33%	0.16%	0.00

The mean and median returns on the value-weighted index produce a remarkable pattern where the lowest quintile has consistently negative median, and mean returns with extremely strong significances. The mean return of -0.155% for the smallest quintile is contrasted with a 0.178% return for the highest quintile using the by-year sort.

The values produced by the other two sorting approaches are equally strong and are consistent with the by-year approach. There is a clear, monotonic pattern of increasing returns from the smallest to the largest quintile for all three approaches. The results for the equally-

weighted index returns are similar, although the negative return for the lowest quintile is no longer significant at the conventional 95% level. Thus, the pattern of monotonically increasing returns in quintiles is strong and the average returns for the top three quintiles are large and strongly significant at the 90% confidence level or better for both indexes.

We interpret the results in Table III as strong support for H3. Longer trading days, on average, earn larger positive index returns while shorter days actually earn negative or zero returns. Therefore our mean last trade time measure (MLTTM) intuitively behaves in a way similar to market volume.

V. Conclusion

Nonsynchronous trading is commonly assumed to cause positive serial correlation in portfolio returns. However, a majority of studies have argued that the autocorrelations due to nonsynchronous trading are significantly less than the observed autocorrelations, which raises doubts about the efficient markets hypothesis. Most studies also assume that nonsynchronous trading induced autocorrelations are idiosyncratic, though there is no direct evidence on the issue. This study addresses the gap and adds to our understanding of market behavior by testing if nonsynchronous trading is indeed idiosyncratic. By using trade-by-trade data and collecting the last trade time for individual stocks, we are able to create statistical measures of market-wide nonsynchronous trading that can be used for further analysis, namely a mean last trade time measure (MLLTM) and dispersion of last trade time measure (DLLTM).

Our results indicate that the time of a stock's last trade is positively related to mean last trade time for the market – contrary to the assumption of idiosyncrasy. Thus, there appears to be a systematic factor which causes stocks to last trade later or sooner. Furthermore, higher size deciles are far more sensitive to this factor than lower size deciles. Next, nonsynchronous trading based models imply that portfolio return autocorrelation should increase with thin trading. However, we find no such increase for the equally and value-weighted portfolios using our proxy of the lagged dispersion in last trade time. This may indicate that return correlation may indeed be due to economic phenomena beyond nonsynchronous trading, furthering the argument for a systematic factor. Finally, volume is known to be positively related to contemporaneous price changes so longer trading days, as measured by mean last trade time, should have similar results. We find reliable evidence that days with later mean last trade time garner positive returns while those with earlier mean trade time yield negative or zero returns. Thus our proxy for volume appears to capture another dimension of market wide liquidity by finding evidence of a systematic factor that governs trade times.

For future research, it would be interesting to attempt to identify the systematic factor(s) that we have evidenced, perhaps by examining news releases of a broad economic nature.

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Mergers and Value Creation in a Post-Liberalized Environment: The Case of India

Alex Meisami and Lalatendu Misra

Abstract

The purpose of this paper is to examine domestic merger and acquisitions in the Indian market following the economic liberalizations in 1995. We find that in in Indian mergers both parties gain with acquirers showing higher abnormal returns and targets showing lower abnormal returns relative to their counterparts in the U.S. Contrary to our expectation that the takeover market in India has become more competitive since 1995, we find little evidence that acquirers' abnormal returns have declined or target abnormal returns have increased over time. In addition, we find evidence that large group affiliated firms have higher announcement returns, and this directly translates into lower target returns. Further, targets belonging to groups can exploit their affiliation and achieve higher abnormal returns.

I. Introduction

We examine the merger and acquisitions activities in India after the liberalization of the Indian economy in 1995. One part of the economic liberalization policy included the relaxation of general corporate climate including the easing of rules regarding corporate control changing activities. During the post-1991 period, policies governing takeovers underwent progressive relaxation following the elections of governments from different parties.

The purpose of this essay is to examine the incidence and nature of control changing transactions; thus, documentation providing insight into the role of regulatory relaxation and its impact on aggregate mergers and acquisitions (hereafter M&A) activity in an economy. We also examine stock price response to the announcement of control changing events. Additionally, we examine the cross-sectional determinants of the abnormal returns in such transactions.

As one important theme of this paper, we study the role of group affiliated companies in Indian M&As. Khanna and Palepu (2000) argue in the context of conglomerate value creation, that the larger group affiliated companies in India are better positioned to create value compared to medium or small group companies. Their argument is based on the possibility of larger companies being able to better harness managerial skills, effectively utilize internal capital markets, and engage in regulatory rent extraction compared to the medium and smaller sized group companies. In the context of M&A, we can argue that these firms are likely to gain based on the same types of advantages. With this focus, we expect to find that larger group affiliated firms achieve higher acquirer gains possibly as a consequence of wealth transfer from the target, whereas, the targets facing large group firm acquirers achieve lower levels of gains.

M&A activity in India subsequent to the economic liberalization period provides a unique laboratory experiment to the researcher. The dismantling of antitakeover regulation and the proactive introduction of control-enabling legislations allow pursuit of richer research questions. For example, one could ask if the acquirers in nascent takeover markets earn positive abnormal returns, a response that is rarely observed in more developed and established economies where the acquirers experience a decline in stock price. Faced with possibilities of great economic

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gains to the merger, both parties to the transaction may well experience positive stock price response.

II. Indian Political and Economic Scene

A. Political Impetus for Change

The Industrial Policy changes promulgated on July 24, 1991 by the Government of India (GOI) addressed a host of policy issues. In particular it encouraged entrepreneurship, development of technology, dismantling of the regulatory system, development of capital markets, and increased competitiveness for the benefit of the common man, which was the main objective of the newly articulated policy. Foreign investment and technology collaboration were to be encouraged to enable acquisition of higher quality technology and to increase and expand the productive base of the Indian economy. The GOI intended to abolish monopolies in all sectors so that the public sector, i.e., government owned industries, would be more limited in scope relative to its prior predominant role in the economy.

The changes in Industrial Policy led to a series of initiatives regarding the abolition of the industrial licensing policy, moving away from capacity licensing, and the system of reservations for public sector undertakings. In order to increase foreign investments, the allowed levels of foreign equity holdings in various industries were increased. Foreign technology agreements were accorded priority to inject dynamism to Indian industry, and pre-entry scrutiny as required by the Monopoly and Restrictive Trade Practices (MRTP) Act was no longer necessary. Based on these policy promulgations there were substantive changes in the bureaucratic protocols and procedures followed by enactment of the strong new laws. The immediate impact of the regulatory and legislative changes was felt on the economic and trade policies which were eventually followed by new laws regarding corporate structures, ownership, and governance, and stock exchange structures.

B. Takeover Regulations in India

There was no organized framework for takeover laws in India prior to 1994. Earlier laws such as the Companies Act of 1956 and Income Tax Act of 1961 addressed some broad issues regarding acquisitions in the pre-liberalization period.

Laws in India use the term “amalgamation” in lieu of merger. Mergers can be effected through “absorption” or by “consolidation”. In absorption, two or more companies merge (amalgamate) into an existing company with one company remaining as the sole survivor. In consolidation, two or more companies combine to form a new company. In an acquisition, an acquiring company takes control of another company with each company possibly remaining independent. Typically, takeovers involve acquisition of not less than 25% of the voting shares of the acquired company. We use the terms mergers and acquisitions interchangeably when there is control changing activity.

The Companies Act (1956) as amended in 2006 lays down specific requirements for mergers and acquisitions. Amalgamation is permitted under the memorandum of association of

the company; otherwise, the permissions of the shareholders, board of directors, and Company Law Board are necessary. Both firms are required to inform the stock exchanges of the proposed merger. The Board of Directors of each company must approve the draft proposal. The board must move the High Court to approve the proposal. In India, each state has its High Court and the parties usually move the High Court in the state of their headquarters. The date of the High Court's hearing is required to be published in two newspapers and the Company Law Board intimated of these actions by the companies.

The shareholders and creditors must approve the draft in separate meetings with 75% majority. After approval by the shareholders and creditors, the High Court approves the amalgamation if it is considered to be fair and reasonable. The High Court's order is then filed with the Registrar of Companies. The assets and liabilities of the acquired company are next transferred in accordance with the High Court's approval. Finally, the exchange of cash or shares depending on the terms of acquisition takes place.

Pursuant to the requirements of the Companies Act, there are a number of activities that must thus take place before a merger is effective. Not all of these transactions are well reported by the financial media in India. We provide a sample of transactions and their report date as culled from the Prowess database published by the Center for Monitoring the Indian Economy (CMIE). The coverage provided in the LexisNexis database is substantially less complete. One consequence of the sequence of activities is the possibility of information leaking prior to the first announcement date in the media. To the extent that the first date is smeared, the observed market response may not fully capture the impact of the announcement: the observed abnormal return is likely to be downward biased.

The Competition Act of 2002 has an impact on merger activity in India. The Competition Commission is authorized to regulate a combination by taking into account competitive effects of the combination and preventing adverse or harmful impact of competition in the relevant product markets. The Monopolies and Restrictive Trade Practices Act of 1969 (MRTP) also applies to mergers to the extent that a merger may cause actual or potential restrictive or unfair trade practices. Many of the restrictive provisions of the MRTP Act relating to mergers and takeovers of businesses were removed subsequent to the economic liberalizations of 1991.

The Foreign Exchange Regulation Act of 1973 (FERA) was substantially amended in 1993 to reverse earlier policies restricting foreign investments in asset and firm acquisition. All restrictions on FERA companies regarding raising funds in India and taking over or holding stakes in Indian companies were removed. This Act was repealed in 2000 and replaced by the Foreign Exchange Management Act or FEMA. Appendix I provides a list of major changes in India's policy regime during the 1991-2005 period.

C. The Takeover Code

The Securities and Exchange Board of India (SEBI) was established under the SEBI Act of 1992. SEBI is the primary regulator of securities markets in India. Primarily there are two

SEBI regulations that govern the M&A transactions in India, and these regulations provided the first set of organized rules to govern such transactions.

The guidelines contained in a regulation called Substantial Acquisition of Shares and Takeovers (popularly called the Takeover Code) were promulgated in 1994, and were subsequently revised and amended. The Takeover Code provides an organized set of laws for regulating takeover activities and guidance to market participants. Guidelines for disclosure of acquired shares, public announcement of identity, purpose, price, offer period, and minimum amount of public acquisitions (at least 20% of shares outstanding) are given.

The Disclosure and Investor Protection Guidelines of 2000 establish guidelines for takeover transactions including contents of offer documents, structure of prospectus, guidelines for advertisement, book building and other necessities. These guidelines address mandatory undertaken by investment bankers and counsels for all parties to a transaction. The promulgation of these regulations has helped remove the fog of uncertainty from the transactions.

Prior to the promulgation of the regulations, there were a plethora of government Ministries and Agencies at the federal level that could impede such transactions at will. Furthermore, any takeover attempt could be challenged by any interested party in a court of law. The legal system moves very slowly in India. Potentially lengthy court actions coupled with uncertain outcomes and the possibility of random bureaucratic intervention greatly impeded takeover activity in India prior to the mid-1990s. Conversely, the clarity in the regulatory environment brought about various regulatory changes and helped M&A transactions starting around 1995.

III. Literature Review

A. Acquirer and Target Abnormal Returns

There is a large body of literature which empirically examines the size of acquirer and target price response and conditions them on the type of industry, time period, type of acquisition, and various characteristics of the transaction. Moeller, Schlingemann, and Stulz (2004) investigate a large sample of U.S. acquirers in the 1980-2001 period. They report that the 3-day cumulative abnormal return (CAR) is 1.10% for the entire sample. However, this abnormal return is entirely caused by small acquirers reporting a 2.32% 3-day CAR; whereas large acquirers generally exhibit positive but insignificant 3-day CAR. Fuller, Netter, and Stegemoller (2002) examine M&As of U.S. firms acquiring domestic or foreign targets in the 1990-2000 period. The sample consists of 3,135 bids made by 539 unique acquirers during this period. They find that bidders gain when they take over a private firm or a subsidiary, but lose when they acquire a public firm. The authors also find a positive relation between the bidders' return and the size of targets and show that bidders gain when they offer stock for acquisition. Kaplan and Weisbach (1992) investigate stock price reaction for both acquires and targets in the 1971-1982 period. They report that the 10-day CAR to be -1.49% for acquirers and 26.9% for targets. Datta, Iskandar-Datta, and Raman (2001) investigate how executive compensations determine M&A decisions. They find that stock price performance is positively related to equity-based compensation of acquiring firms' managers around the announcement date.

Overall, the literature on the U.S. M&As suggests that acquirers (targets) face zero or negative (positive) abnormal returns (see Andrade, Mitchell, and Stafford, 2001). Similar reaction, around the announcement, is observed in the international markets, although there are exceptions. Alexandridis , Petmezas , and Travlos (2010) find that except for acquirers in highly competitive takeover market such as U.S., U.K., or Canada, acquirers in other countries on average benefit from paying lower premium. In addition, they find that even in share-to-share offers, acquirers break even at worst. Interestingly, in these markets targets benefit notably less indicating that the synergy benefits are more equally divided between the two parties compared to in U.S. and other highly competitive markets. Chari, Ouimet, and Tesar (2010) find 1.16% CAR3 for acquirers of developed countries when the acquirers take majority control in an emerging market target. The CAR3 is positive and significant only when targets are from emerging markets. The authors do not find similar results when the acquirer takeover target is in other developed countries. They also find a relation between the size of acquirers' stock price increase and the contracting environment in the emerging market: the weaker the contracting environment the higher the stock price increase.

B. Indian Group-Affiliated Firms

Many Indian companies belong to industrial groups. Such groups have elements similar to Keiretsus in Japan or to Chaebols in Korea. Typically, the Indian group companies are composed of a number of firms having manufacturing focus in different industries. It is possible that the development of such industrial organizational structure was a consequence of and in response to ownership constraints in various industries imposed by government regulations. Large groups such as the Reliance group or the Tata group would have presence in twenty or more different and widely divergent industries.

One important area where Indian groups differ from the Japanese or Korean group structures is in the typical absence of financial firms (banks) as members of the groups. Lensink, Molen, and Gangopadhyay (2003) explore the effect of group affiliation on corporate investment behavior in India. They find that compared to stand-alone firms, group affiliates in India have better access to external financing due either to superior access to financial institutions or due to the presence of well functioning internal capital markets.

Gopalan, Nanda, and Seru (2007) examine a number of issues relevant to internal capital markets in Indian business groups. They find that group firms effectively utilize intra-group loans to shift cash between the group members and support weaker firms or those with negative earning shocks. They show that group firms use loans to avoid default, and the possible spill-over effect to the rest of the group. They also report that after one of the group firms goes bankrupt, other group affiliates, including financially healthier members, are more likely to go bankrupt.

The link between characteristics of firms and their financial performance is examined by Kakani, Saha, and Reddy (2001). A firm's share price is directly related to its size, marketing expenses, and international diversification. Size can lead to superior market power and financial influence while marketing expenditure can lead to higher market share. Size and marketing expenses can potentially attract the attention of investors and analysts and influence share price.

Khanna and Palepu (2000) provide a careful analysis of diversified Indian business groups. They document that firms within a great number of diversified Indian business groups have lower Tobin's *q* relative to unaffiliated firms, yet firms affiliated with large, prominent business group exhibit a higher Tobin's *q* than unaffiliated firms do. They find that, unlike in the U.S. market, creating large, highly diversified group companies in India results in value creation.

Khanna and Palepu argue that diversified group companies could help in filling the void for intermediating institutions in emerging markets in charge of dealing with product, labor, and capital markets. Economies of scale enable large diversified groups to afford the fixed costs needed to provide these types intermediating services. Larger Indian business groups are also able to extract rent in the pre-liberalization highly regulated Indian economy. Small or mid-size group companies, however underperform relative to large group companies. They argue that the underperformance is due to lower levels of management skills, fewer internal processes, or lower levels of political connections possessed by the smaller group companies. Chu (2004) finds similar results for Taiwan. He investigates the effect of group affiliation on profitability and finds that cost and benefits of group affiliation are related to the size of the business groups. He reports that firms affiliated with small and medium- sized groups illustrate lower performance relative to the firms affiliated with largest business groups and non-group firms.

In the M&A context, it is likely that large group-affiliated acquirers would have vast financial resources, and the ability to scare away the competition via positions in unrelated transactions. Thus, acquirers who are large group companies can wield higher levels of bargaining power vis-à-vis the targets than non-group acquirers. It is likely that the higher level of negotiating power of the large group affiliated acquiring firms can lead to greater rent extraction from the targets, i.e., higher abnormal returns to the acquirer and lower abnormal returns to the target. The direct impact of size of the acquirer is likely to be negatively related to acquirer abnormal returns if the gains to acquisitions are relatively fixed. However, the larger group firms may get higher abnormal returns compared to smaller or medium sized group firms. The interaction term between size and group affiliation matters as we will discuss in the next section.

IV. Testable Hypotheses

Finance literature documents zero or negative announcement period abnormal returns to acquirers and positive returns to targets. The combined portfolio return for the acquirer-target pair is generally positive. Andrade, Mitchell, and Stafford (2001) report that in the U.S., acquirers' average three-day abnormal returns are negative when mergers are financed with stock and zero when financed with cash. One reason for the low acquirer return in the U.S. is a highly competitive market for corporate control forcing acquirers' rents to zero.

If competition plays a role in explaining bidders' low announcement period abnormal returns, we expect domestic acquirers to pay a lower premium in developing countries. Thus, one would generally expect an "underdeveloped market" argument that lack of competition in the market for corporate control would lead to the acquirer capturing a greater part of the

potential available synergies. This would also imply that the target's share of the synergies would be lower leading to lower abnormal response for the target. We hypothesize that:

H1: *The announcement period abnormal returns are expected to be higher and generally positive for acquirers and lower for targets, relative to their U.S. counterparts.*

The counter argument to the "underdeveloped market" hypothesis is that in the presence of pent-up merger demands, a sudden lifting of the barriers to mergers would provide strong incentive for acquirers to find targets at short notice and would likely lead to potentially competitive behavior among the acquirers. As a consequence, the observed responses would be similar to the competitive outcome as seen, for example, in the U.S. market. This is the alternative to H1.

The Indian government's liberalization policies have been undergoing fine tuning for some time as the governments from different parties have been elected. With the entry of foreign acquirers and supply of foreign capital, the level of competition in the market for corporate control is expected to have increased in the recent years. Hence the following hypothesis:

H2: *Over time, the difference between abnormal returns of acquirers in India and their U.S. counterparts is expected to have narrowed.*

The role of size of acquirer on abnormal returns is expected to be negative assuming constant synergy; i.e., large firms have lower percent return. However, larger group affiliated firms are likely to achieve greater abnormal returns as we infer from the arguments put forth by Khanna and Palepu (2000). The larger group firms will get higher abnormal returns compared to smaller or medium sized group firms due to potentially higher management skills, more internal process, or more political connections all leading to a better rent extraction from the acquisition. Thus, the size effect arises from two arguments. We can analyze it in the regressions by examining the direct size effect, which is expected to be negative, and the interaction between size and group affiliation, which is expected to be positive. Therefore,

H3: A*cquirers in general are expected to have lower announcement gains in account of size, but large group-affiliated firms are expect to achieve higher abnormal returns.*

V. Data

A. Sample

We used the Securities Data Company (SDC) database to identify all Indian domestic mergers and acquisitions from January 1995 until December 2008, a total of 5,274 observations. We restricted our sample to the acquisitions that resulted in change of control. Some of the transactions obtained from SDC were not acquisitions, but involved asset purchases and were eliminated. Firms in financial sectors are also excluded. We read all stories of transactions from LexisNexis. The news date obtained from LexisNexis announcements is used as the event date in the event of discrepancy with the SDC date.

We used Prowess India and Datastream to extract all time-series and cross-sectional variables. The Prowess dataset is issued by the Center for Monitoring Indian Economy (CMIE).

It is a commercial database that provides price and financial data for most Indian publicly traded companies. We limited our sample to firms whose prices appear in either Prowess or Datastream datasets. The price data available in these databases are not necessarily subjected to the verification commonly employed in the CRSP dataset. Consequently, we filter the price data, and examine each stock's data series to ensure data integrity and identify potential data errors. In many of these cases, the price data needed to be adjusted for stock splits and dividends. We use the BSE100 index data as the index series in India.

B. Data Description

Our final sample consists of 431 domestic acquisitions. We show the time distribution of acquisitions in Table I. We observe an upward trend in acquisitions since 1995, with a jump in 2000 in keeping with further liberalization of takeover laws in India. The highest number of acquisitions occurred in year 2006. The number of transactions reported during 2008 is relatively small since we did not have access to M&As occurred after May 2008 in Prowess.

Table I: Distribution of Indian M&A Sample Over Time

Year	Number of Transactions	Percent of Total
1995	12	2.78
1996	2	0.46
1997	9	2.09
1998	16	3.71
1999	28	6.50
2000	42	9.74
2001	32	7.42
2002	37	8.58
2003	28	6.50
2004	35	8.12
2005	54	12.53
2006	69	16.01
2007	45	10.44
2008	22	5.10
Total	431	100.00

Notes: The time distribution of the sample of merger and acquisition transactions in India from 1995 to 2008 is given below.

We show the industry classification of the sample acquirers in Table II, based on the National Industrial Code of India (NIC). We provide a detailed break-down of the sample into NIC3 industry groupings and also classify whether these industries are from protected or liberalized industries as defined by the government of India. The protected classification has implications for control changing transactions since the foreign ownership for protected industries is limited by law. The protected and liberalized sample consists of 115 and 311 observations respectively. For the protected group, about one quarter of the acquisitions occur in two industries: "textiles" and "petroleum products". For the liberalized group, about one quarter of the acquisitions occurs in "chemical products" and approximately one sixth of the acquisitions occur in "software" industry.

We present the distribution of assets and sales (in crores of rupees, 1 crore = 10^7) for targets and acquirers in Table III, Panel A. The acquirers are larger than the target whether size is measured by assets or by sales. Relative size is computed as the ratio of target to acquirer assets or sales. When size is measured by assets, mean, and median relative size are 107.1 % and 64.7% respectively, and when size is measured by sales, mean and median relative size is 79.7% and 54.6% respectively. When measured by assets, only 70 targets in our sample have assets available, and when measured by sales, only 72 of targets have assets available. This is mainly due to the fact that many targets are private companies or their data is not available in either of the primary databases.

Table II: Industry Classification of the Sample Transactions

NIC3	N	Percent	Industry description
171	14	3.25	Spinning, weaving and finishing of textiles.
232	14	3.25	Manufacture of refined petroleum products
55	9	2.09	Hotels and restaurants
98	8	1.86	Extraterritorial organizations
401	8	1.86	Electricity and gas supply
452	8	1.86	Construction
642	5	1.16	Telecommunications
92	4	0.93	Recreational, cultural and sporting activities
172	4	0.93	Manufacture of textiles
-	41	9.51	Miscellaneous other industries
Protected	115	26.68	
242	75	17.40	Manufacture of other chemical products
722	55	12.76	Software consultancy and supply
241	26	6.03	Manufacture of basic chemicals
269	20	4.64	Manufacture of non-metallic mineral products
154	17	3.94	Manufacture of other food products
271	16	3.71	Manufacture of Basic Iron & Steel
291	12	2.78	Manufacture of general purpose machinery
272	9	2.09	Manufacture of basic precious and non-ferrous metals
343	9	2.09	Manufacture of parts and accessories for motor vehicles
-	72	16.71	Miscellaneous other industries
Liberalized	311	72.16	
NIC3 not available	5	1.16	
All	431	100.0	

Notes: We present a summary of the number of M&A transactions in the sample by industry classification. We employ the National Industry Classification (NIC) code of India as amended in 1998. The 5 digit NIC code for each firm is obtained from Prowess database and consolidated at the 3 digit level. We classify the 3 digit NIC code as "liberalized" and "protected" following the liberalization document of the Industrial Policy Resolution of 1991 (Office of the Economic Advisor, Government of India, 2001). Percent refers to the percent of the total.

Table III: Summary Statistics Regarding Size

Panel A. Assets and Sales

	Assets			Sales		
	Acquirer	Target	Relative Size(%)	Acquirer	Target	Relative Size(%)
Mean	2,795	1,459	107.10	3,307	1,814	79.70
N	419	70	69	419	72	71
Maximum	72,164	13,074	537.00	117,979	33,117	489.90
Q3	1,812	1,345	124.10	1,610	1,383	100.00
Median	587	583	64.70	578	488	54.60
Q1	188	232	19.90	179	215	15.50
Minimum	0	22	1.90	0	10	0.70

Panel B. Group vs. Non-group and Liberalized vs. Protected Classifications

	Acquirers						Targets					
	Assets			Sales			Assets			Sales		
	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median	N
Group companies	2,491	877	269	2,428	823	269	1,352	653	54	1,625	499	56
Non-group companies	3,503	221	143	5,122	208	143	1,820	362	16	2,474	311	16
Difference	-1,013	655***		-2,694**	614***		-468	290		-850	188	
Statistics	(1.20)	(<.01)		(2.11)	(<.01)		(0.73)	(0.28)		(0.69)	(0.29)	
Protected industries	6,266	678	114	8,341	645	114	2,462	852	21	3,820	532	23
Liberalized industries	1,522	584	300	1,449	582	300	1,029	576	49	872	463	49
Difference	4,743***	93		6,891***	62		1,433**	276		2,947***	69	
Statistics	(5.48)	(0.19)		(5.24)	(0.41)		(2.55)	(0.40)		(2.81)	(0.80)	

Notes: Panel A lists acquirer's (target's) total assets and sales. Relative size is equal to the ratio of target total assets (sales) to acquirer total assets (sales). Panel B compares the mean (median) assets (sales) for group versus non-group companies and companies in protected versus liberalized industries. Assets and sales are presented in crores of Rupees (1 crore = 10^7 Rupees). The numbers in parentheses are *t*-statistics for one-sided *t*-test or the *p*-values from Wilcoxon–Mann–Whitney two-sample test for medians. Data is primarily obtained from Prowess and augmented by additional data from DataStream. The significance levels of the difference between the mean (I-test) and median (Wilcoxon–Mann–Whitney test) in panel B are shown by, ***,**, and * denoting statistical significance at the 1%, 5%, and 10% levels.

Nevertheless, using either measure, the relative size is substantially greater than approximately 10% which is the relative size of U.S. targets as reported in Fuller, Netter, and Stegemoller (2002) and in other studies.[1] In Panel B, we present sample data by two classifications: group versus non-group firms, and protected versus liberalized industries. There are 269 group acquirers compared to143 non-group firms, and 114 protected acquirers against compared to 300 from liberalized industries. Group-affiliated acquirers have median assets of 877 and non-group acquirers have median assets of 221 crores of Rupees, a highly significant difference. Similarly, group-affiliated acquirers have median sales of 823 and non-group acquirers have median assets of 208 crores of Rupees, another highly significant difference. Based on the average value of assets or sales, non-group firms are larger, but the difference is not statistically significant.

Overall, these results are consistent with the expectation that group affiliates in India are larger by either assets or size measures than non-group firms especially in the context of M&A transactions. For targets, our sample size consists of 70 firms, 54 group firms versus 16 non-group firms. Based on assets or sales, there is no difference between the two groups. Similar comparison between protected versus liberalized industries shows that acquirers and targets in the protected industries have larger means and medians. For all the cases, the difference between the means (medians) of the two groups is significant (insignificant).

VI. Empirical Results

A. Event Study Results

The announcement period abnormal returns (AAR hereafter) for acquirers are reported in Table IV. We use standard event study methods (see MacKinlay, 1997). The SDC reported announcement date is day zero in event time. For each transaction we compared the SDC announcement date with the corresponding announcement date extracted from LexisNexis news section. We used dates from LexisNexis in a case where the two announcement dates did not mach. The market model is estimated using the BSE 100 index return. Our estimation period is [-250, -31] relative to the announcement date. Abnormal returns and corresponding statistics for the period -15, +15 are reported. Mean AAR is positive and significant for days -1, 0, and 1. Median AAR is also highly significant for day 0 and 1.

We consider 3 day window encompassing -1, +1 as the announcement period, and report the cumulative abnormal returns (CAR) corresponding to various windows in Panel B. Immediately prior to and following the announcement, mean AARs are insignificant. We report CAR3 (2.06%), CAR9 (2.86%), both of which are significant at the 1% level. We present CAR for [-20,-8] window which is negative and insignificant, and [+2, +20] which is -2.23% and significant at the 1% level. A positive price run up for the acquirer suggests the possibility that the market for corporate control is not highly competitive in India. However, the acquirers lose almost all of the gain subsequent to the announcement as evident from CAR during the [+2, +20] period. Indeed the CAR for the 41 day time window is indistinguishable from zero. All the short term response is eventually relinquished in the follow-up period.

[1] We have also used SDC data to calculate the relative size and obtain relative size measures that are much larger than what Fuller et al. (2002) report.

Table IV: Acquirer Abnormal Returns

Panel A: Acquirer abnormal returns

		Mean	Proportion		Binomial		
Day	N	AAR(%)	*z*-statistic	AAR(%)	p-Value	Positive	z statistic
-10	421	-0.07	-0.37	-0.24	0.15	47%	-1.32
-9	418	-0.34	-1.27	-0.42***	0.01	41%***	-3.52
-8	422	-0.16	-0.49	-0.33	0.11	45%*	-1.85
-7	422	0.13*	1.65	-0.11	0.93	48%	-0.88
-6	427	0.22	1.10	-0.04	0.99	48%	-0.63
-5	427	0.10	0.73	-0.18	0.33	43%***	-2.86
-4	424	0.22	1.61	-0.08	1.00	48%	-0.68
-3	423	0.03	0.18	-0.13	0.77	48%	-0.92
-2	421	0.10	0.54	-0.11	0.73	48%	-1.02
-1	421	0.61***	3.15	0.09*	0.06	51%	0.34
0	430	1.18***	7.78	0.63***	0.00	60%***	4.15
1	428	0.28**	2.48	-0.10	0.57	48%	-0.87
2	424	-0.35**	-2.10	-0.46***	0.00	40%***	-3.98
3	425	-0.39**	-2.34	-0.50***	0.00	37%***	-5.19
4	423	-0.17	-0.94	-0.35*	0.08	44%***	-2.58
5	426	-0.33**	-2.35	-0.52***	0.01	43%***	-2.91
6	427	-0.25	-0.49	-0.40***	0.01	44%**	-2.37
7	427	-0.01	0.23	-0.30	0.22	44%**	-2.56
8	426	-0.10	0.10	-0.29	0.11	42%***	-3.39
9	426	-0.06	-0.12	-0.08	0.59	48%	-0.97
10	426	-0.23	-1.07	-0.47***	0.01	42%***	-3.49
11	422	-0.12	-0.30	-0.35**	0.05	42%***	-3.21
12	425	-0.29	-1.51	-0.55***	0.00	40%***	-4.03

Panel B: Acquirer cumulative abnormal returns (CAR)

Range	CAR(%)	z-Statistic
[-1,1]	2.06***	7.73
[-7,+1]	2.86***	6.39
[-20,-8]	-0.25	-0.08
[2,20]	-2.23***	-2.78
[-20, 20]	0.38	1.55

Notes: Sample is for 431 Indian acquirers acquiring from 1995 to 2008. Standard event study methods are used. The market model is estimated using the BSE 100 index over [-250,-31]. Abnormal mean and median returns (AAR) are shown in Panel A which also reports the ratio of events with positive abnormal returns (with the corresponding binomial *z*-Statistic). Panel B presents cumulative abnormal returns (CAR) corresponding to two event windows of interest. *,**, and *** denotes significance at 10%, 5%, and 1% levels, respectively.

We report the event-study for targets in Table V. The event period mean AARs are positive and significant with a CAR3 of 5.36%. Median AAR is also positive for day -1 and 0. In

the post announcement period, the abnormal returns are negative and statistically not significant. The 41 day CAR for targets is 11.28%, with pre-announcement run-up and no post-announcement give-up. Target CAR is insignificant for the [+2, +20] window suggesting that unlike acquirers, targets keep the announcement gain. Campa and Hernando (2004) find CAR9 of 9% over one month, t = [-15, +15], for a European Union sample. Kaplan and Weisbach (1992) find -1.49 % (significant) CAR for acquirers in [-5,+5] window for U.S. acquirers during the 1971-1982 period, and Andrade, Mitchell, Stafford (2001) find 16% CAR in [-1,+1] window for U.S. targets during the1973-1979 period. Our results support the first hypothesis (H1) suggesting that abnormal returns are higher for acquirers, and generally positive, and lower for targets, relative to their U.S. counterparts based on the short term announcement period of three days. Our finding is consistent with Alexandridis, Petmezas, and Travlos (2010) who report that in most takeover markets, acquirers lose less and targets gain less relative to U.S., U.K., and Canadian takeover markets which are highly competitive.

Table V: Target Abnormal Returns

Panel A: Target abnormal returns

		Median		Mean		Proportion	Binomial
Day	N	AAR(%)	z-statistic	AAR(%)	p-Value	positive	z statistic
-10	97	-0.25	-0.45	-0.12	0.21	42%	-1.52
-9	96	0.25	0.17	-0.12	0.59	43%	-1.43
-8	97	0.46	1.61	0.19	0.35	53%	0.51
-7	97	0.95*	1.95	0.30*	0.05	58%	1.52
-6	97	0.09	0.35	-0.20	0.81	44%	-1.12
-5	97	1.05***	3.40	0.07*	0.06	53%	0.51
-4	96	0.82**	2.20	0.20	0.22	52%	0.41
-3	97	0.47	1.45	0.09	0.46	54%	0.71
-2	97	0.58	1.53	0.15	0.24	51%	0.10
-1	96	1.96***	4.85	0.75***	0.00	61%**	2.25
0	97	2.42***	5.37	0.39***	0.00	56%	1.12
1	96	0.98*	1.93	0.00	0.51	48%	-0.41
2	97	-0.14	-1.18	-0.49	0.46	42%	-1.52
3	97	-0.68	-1.64	-0.38**	0.04	38%**	-2.34
4	96	0.10	-0.14	-0.10	0.86	43%	-1.43
5	96	0.16	0.68	0.02	0.86	50%	0.00
6	96	-0.04	-0.19	-0.01	0.89	46%	-0.82
7	97	0.30	0.46	-0.35	0.30	38%**	-2.34
8	96	0.36	1.54	0.00	0.36	49%	-0.20
9	97	-0.34	-0.83	-0.48	0.10	37%**	-2.54
10	97	0.94**	2.28	-0.13	0.61	41%*	-1.73

Panel B: Target cumulative abnormal returns (CAR)

Range	CAR(%)	z-Statistic
[-1,1]	5.36***	7.01
[-7,+1]	9.32***	7.68
[-20,-8]	2.02	1.34
[2,20]	-0.06	0.59
[-20, 20]	11.28***	6.97

Notes: Sample is for 97 Indian target firms acquired from 1995 to 2008. Standard event study methods are used. The market model is estimated using the BSE 100 index over [-250,-31]. Abnormal mean and median returns (AAR) are shown in Panel A which also reports the ratio of events with positive abnormal returns (with the corresponding binomial *z*-Statistic). Panel B shows cumulative abnormal returns (CAR) corresponding to event windows of interest. *,**, and *** denotes significance at 10%, 5%, and 1% levels.

The potential for information leakage prior to the announcement captured in LexisNexis cannot be overstated. We provided extensive discussion in section 2 regarding the multitude of steps that the acquiring firm has to undertake prior to a merger. It may be noted that the announcement date as used in our event study is not necessarily the first information date. Earlier dates are not reported in Indian media, but the news itself is likely to percolate to the market via informal channels and influence market prices. In short, there is a substantial likelihood of leakage which biases abnormal returns downward for both the acquirer and the target. Similar information leakage effect in different context has been reported in other emerging markets (see Bhattacharya et al, 2000).

Acquirer and target abnormal returns can be well associated with macroeconomic conditions around the announcement date. Some acquirer or target abnormal returns can be driven by favorable market conditions. If the stock market is "hot" any M&A news would be desirable resulting in positive abnormal returns. In Table VII we distinguish between hot and cold markets by comparing the annual returns for the BSE100 index based on monthly returns reported by the exchange during the 1995-2008 period.

An annual return in excess of 15% is classified as a "Hot Market". Acquirer and target abnormal returns can be well associated with macroeconomic conditions around the announcement date. Some acquirer or target abnormal returns can be driven by favorable market conditions. If the stock market is "hot" any M&A news would be desirable resulting in positive abnormal returns. In Table VI we distinguish between hot and cold markets by comparing the annual returns for the BSE100 index based on monthly returns reported by the exchange during the 1995-2008 period. An annual return in excess of 15% is classified as a "Hot Market". Years 1999, and 2003 through 2007 are hot market years according to the specification above. The average return for these years is 44.27%. For the remaining years in the sample period (cold years) the average return is -18.80%.

Table VI: BSE100 Annual Returns

Year	Annual Return (%)	Economy
1995	-23.23	
1996	-4.71	
1997	-15.02	
1998	-5.24	
1999*	50.98*	Hot market
2000	-23.69	
2001	-24.60	
2002	2.00	
2003*	79.64*	Hot market
2004*	15.92*	Hot market
2005*	43.35*	Hot market
2006*	38.98*	Hot market
2007*	43.97*	Hot market
2008	-45.34	
	Average Return (%)	
Hot Market	44.27	6 cases
Cold Market	-18.80	8 cases

Notes: We present below the compounded annual returns for the BSE100, based on monthly returns reported by the exchange, for the 1995 to 2008 period. An annual return in excess of 15% is indicated as "Hot Market", otherwise the market is deemed to be a "Cold Market".

We provide a bivariate comparison of market conditions in Table VII. As expected, acquirer CAR3 and CAR9 are significantly higher in hot markets relative to cold markets. We document that group acquirers have lower announcement returns than non-group acquirers, but the difference is not statistically significant as shown in Table VIII. Acquirers from liberalized industries have somewhat lower CAR3 and CAR9 compared to acquirers from protected industries, and the difference is significant. Acquirers whose eventual parent may be a non-Indian firm tend to achieve greater abnormal returns than do Indian parent acquirers, and the difference of the 3-day CARs is significant. Acquirers who offer cash experience a lower CAR3 than non-cash acquirers consistent with the notion that cash payout is real and stock exchange mergers are mere paper transactions. Acquirers who are growth firms tend to have lower CAR3 than non-growth acquirers. Acquirers of government divestments experience higher CAR3 and CAR9 than other acquirers, and the differences are significant.

Table VII: Bivariate Comparisons of Acquirer Abnormal Returns

			Difference
	Group Firms	*Non-Group Firms*	
CAR3	1.35%	3.26%	-1.92%
CAR9	1.62%	5.17%	-3.55%
N	280	151	
	Liberalized Industry	*Protected Industry*	
CAR3	1.89%	1.95%	-0.05%***
CAR9	2.68%	2.83%	-0.15%**
N	311	115	
	Indian Parent	*Non-Indian Parent*	
CAR3	1.81%	2.46%	-0.64%**
CAR9	2.89%	2.61%	0.28%***
N	313	121	
	Cash	*Non-Cash*	
CAR3	1.54%	2.13%	-0.59%***
CAR9	1.16%	3.30%	-2.14%***
N	85	351	
	Growth Firms	*No-growth Firms*	
CAR3	1.54%	2.13%	-0.59%***
CAR9	3.70%	2.68%	1.02%***
	78	353	
	Govt. Divestment	*Non-Divestment*	
CAR3	4.69%	1.91%	2.79%***
CAR9	2.90%	2.86%	0.04%***
N	17	414	
	Hot Stock Market	*Cold Stock Market*	
CAR3	2.36%	1.51%	0.84%**
CAR9	3.47%	1.95%	1.52%**
N	259	172	

Notes: In this table we present bivariate comparisons of acquirer abnormal returns based on; group versus non-group firms, cash versus non-cash transactions, listed versus unlisted acquirers, acquirers in liberalized versus protected industries, growth versus no-growth acquirers, divestment versus non-divestment acquisitions, Indian versus non-Indian parent acquirers, and acquisitions in hot versus cold markets. Difference between CAR3 and CAR9 [-7, +1] is computed for each group and corresponding *z*-statistics are presented. *, **, and *** denotes significance at 10%, 5%, and 1% levels, respectively.

B. Trend in Acquirer and Target Abnormal Returns

Figures I and II provide acquirer and target CAR3 and CAR9 for periods 1995-99, 2000-02, 2003-05, 2006-08. Our second hypothesis (H2) predicts that over time the difference between abnormal returns of acquirers and targets in India and their U.S. counterparts should narrow

down if the market for corporate control in India has become more competitive. We find contrary evidence to H2 in these Figures. We do not observe any clear pattern that acquirer (target) abnormal returns have decreased (increased) over time.

C. Cross-Sectional Analysis: Acquirer Abnormal Returns

Group-affiliated firms in India are larger than non-group firms when measured by sales or assets. We examine whether being affiliated with a group company impacts gains to the acquirers. Out of the total 419 cases, there are 269 group affiliated firms, and 150 are not group affiliated. Among the group affiliated firms there are 100 firms that can be characterized as small using the median size of the sample. The CAR3 and CAR9 are positive in both group and non-group acquirer cases. Khanna and Palepu (2000) also show that there is no significant difference between the two groups in terms of ROA or Tobin's *q*.

We report cross-sectional analysis of acquirer returns in Table VII. We use a weighted least squares approach with the inverse of the event period standard errors as weights to correct for heteroscedasticity. The dependent variables are SAR3 using the 3 day prediction error, and SAR9 using the 9 day prediction error. All dependent variables in the regression are also weighted. Size is the log of assets and a high size dummy is set to 1 when the size is higher than median size and 0 otherwise. Run-up is defined as the sum of log (1+AR) over the estimation period from [-250, -31] relative to the event date, where AR is the stock excess return over index return. High runup dummy is set to 1 when runup is higher than median runup and 0 otherwise. High ROA dummy is set equal to 1 when ROA is higher than median; all-cash dummy is set to 1 when the transaction is paid by cash ROA and 0 otherwise; Group firm dummy is set to 1 if a firm belongs to a group company, else the dummies are set to 0.

With regard to the variables, there are the following expectations; size is expected to be negatively related with abnormal returns, high performing acquirers (High Runup) are likely to experience higher abnormal returns based on momentum, more profitable acquirers (High ROA) are expected to experience lower abnormal returns, cash payment is expected to have negative coefficient, and Group firms' response is likely to be conditioned on their size.

We find evidence that more profitable acquirers with higher ROA obtain lower AR, possibly because the acquisition is more likely to drag their profits down than increase them. Conversely, acquirers with lower profits are likely to experience higher abnormal returns due to potential acquisition of more profitable entities. We find some evidence of past stock run-up suggesting momentum results in higher acquirer returns. Importantly, we find that acquirers who belong to a group face lower announcement returns, significant at 5% for SAR3 and at 1% for SAR9, a result that is consistent with H3. Small or mid-size group companies do not enjoy the same benefits as large group companies. To test the effect of size on acquirer announcement returns we interact the acquirer size dummy with the group affiliation dummy. The interaction term has a positive coefficient and is significant at the 10% level for SAR9. Thus, larger sized group firms obtain higher level of response than do smaller group firms consistent with Khanna and Palepu's (2000) findings.

D. Cross-Sectional Analysis: Target Abnormal Returns

Our sample of targets is substantially smaller than the acquirer sample with 97 firms for abnormal returns and 80 observations for cross-sectional regressions. We report results of weighted least squares regressions with SAR3 or SAR9 of the target as dependent variables in Table IX. We use hot-market-dummy along with target size dummy, target cash transaction dummy, and target group firm as control variables and add to these variables acquire size dummy in conjunction with its interaction with the acquirer group dummy.

We observe a positive coefficient for acquirer size dummy, significant at the 1% level and a negative coefficient for the interaction between acquirer high size and acquirer group status which is significant at the 5% level. The sign of these coefficients are the mirror image of the sign from Table VII describing acquirer returns. The acquirer gains come from target losses. Specifically, these acquirers (high size, group) are better able to extract the gains from the targets. Targets that belong to groups obtain higher returns presumably due to higher quality management and the value of their affiliation. Therefore, the acquirer is willing to pay a higher price for the targets where it can possibly use some benefits of the target's groups. The high size of the target shows weak negative response.

Cash payment dummy has a negative sign for both regressions. This dummy has also a negative coefficient in the acquirer regressions. It is a puzzle why the cash payment variable is negative for targets, especially since it is also negative for the acquirer. Symmetry arguments would suggest that cash payments would be favorably viewed by the target shareholders unless they are paid less in cash transactions.

Table VIII: Cross-Sectional Analysis of Acquirer Abnormal Return

	Dependent Variable	
Variable	SAR3	SAR9
Constant	0.04**	0.07***
	(4.74)	(5.27)
Hot Market	-0.00	-0.01
	(-0.63)	(-0.81)
High ROA	-0.02***	-0.02**
	(-3.00)	(-2.35)
All-Cash Payment	-0.01	-0.03**
	(-1.05)	(-2.33)
High Runup	0.01*	0.01
	(1.94)	(1.00)
Group Firm	-0.02**	-0.05***
	(-2.35)	(-3.81)
Group Firm* High Size	0.00	0.02*
	(0.05)	(1.82)
F-value	7.91	8.32
Adj. R^2	0.10	0.11
N	419	419

Notes: This table presents weighted OLS regression. Dependent variable is 3 or 9-day standard abnormal returns (SAR3 and SAR9). Weight is defined as standard deviation of prediction for 3 day [-1,+1], and 9 day [-7,+1] windows. All the variables used in the regression are divided by the weight to adjust for heteroscedasticity. Size (log of assets); high size dummy, set to 1 when size is greater than median size and 0 otherwise; Runup, defined as the sum of log (AR+1) from [-250, -30], where AR is the stock excess return over index return; High runup dummy, set to 1 when Runup is higher than median Runup and 0 otherwise; high ROA dummy, equal to 1 when ROA is higher than median ROA and 0 otherwise. All-cash dummy is set to 1 when the transaction is paid by cash or 0 otherwise, Group Firm dummy is set to 1 if a firm belongs to a group company and 0 otherwise. Numbers in parenthesis are t-values. *, **, and *** denote significance at 10%, 5%, and 1% levels.

Table IX: Cross-Sectional Analysis of Target Abnormal Return

	Dependent Variable	
Variable	SAR3	SAR9
Constant	-0.01	0.04
	(-0.18)	(0.82)
Hot Market	-0.01	-0.02
	(-0.27)	(-0.51)
High Size	-0.04*	-0.06
	(-1.75)	(-1.60)
All-Cash Payment	-0.05*	-0.09**
	(-1.96)	(-2.26)
Target Group Firm	0.07*	0.07
	(1.76)	(1.15)
Acquirer High Size	0.12***	0.19***
	(2.79)	(2.70)
Acq. Group Firm* Acq. High Size	-0.10**	-0.17**
	(-2.05)	(-2.28)
F-value	3.44***	4.11***
Adj. R^2	0.18	0.21
N	80	80

Notes: This table presents weighted OLS regression. Dependent variable is 3 or 9-day standard abnormal returns (SAR3 and SAR9) for targets. Weight is defined as standard deviation of prediction for 3 day [-1,+1], and 9 day [-7,+1] windows. All the variables used in the regression are divided by the weight to adjust for heteroscedasticity. Size (log of assets); high size dummy, set to 1 when size is greater than median size and 0 otherwise; Runup, defined as the sum of log (AR+1) from [-250, -30], where AR is the stock excess return over index return; High runup dummy, set to 1 when Runup is higher than median Runup and 0 otherwise; high ROA dummy, equal to 1 when ROA is higher than median ROA and 0 otherwise. All-cash dummy is set to 1 when the transaction is paid by cash or 0 otherwise, Group Firm dummy is set to 1 if a firm belongs to a group company and 0 otherwise. Numbers in parenthesis are t-values. *, **, and *** denote significance at 10%, 5%, and 1% levels.

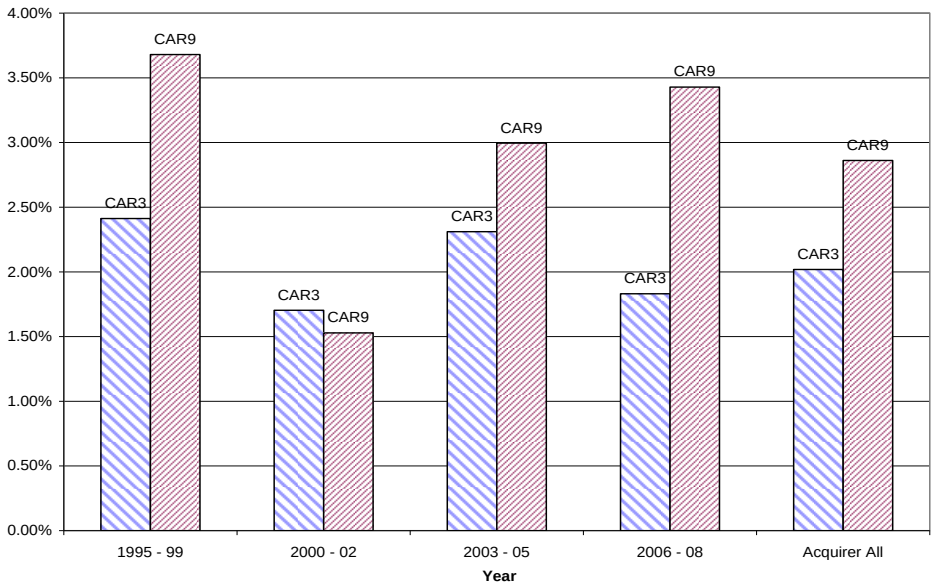
VII. Conclusion

Our study provides the first examination of mergers in the Indian market during the 1995-2008 following the economic liberalizations. We document some aspects of the opening of a vibrant market for control. The price response in this market is different from those reported in developed or other markets. The size of gains to participants around the announcement of takeovers is usually sample-specific. Most domestic and international studies, however, report negative (positive) announcement returns for acquirers (targets). Consistent with Alexandridis, Petmezas, and Travlos (2010), we find that in Indian mergers both parties gains with acquirers (targets) showing higher (lower) abnormal returns relative to acquisitions in the U.S. Contrary to our expectation that the takeover market in India has become more competitive since 1995, we find little evidence that acquirers' abnormal returns have declined or target abnormal returns have increased over time.

Literature regarding conglomerates shows negative correlation between diversification and value creation. Khanna and Palepu (2000) report that contrary to the U.S. experience, creating large, highly diversified group companies in India results in value creation for the whole group. Consistent with their findings, we present evidence that large group affiliated acquirers have higher announcement returns, and this directly translates into lower target returns. Targets belonging to groups can exploit their affiliations, and possibly due to better bargaining power, achieve higher abnormal returns. The nature of industrial consolidations and its impact on abnormal returns as well as potential synergy gains is an area of future study.

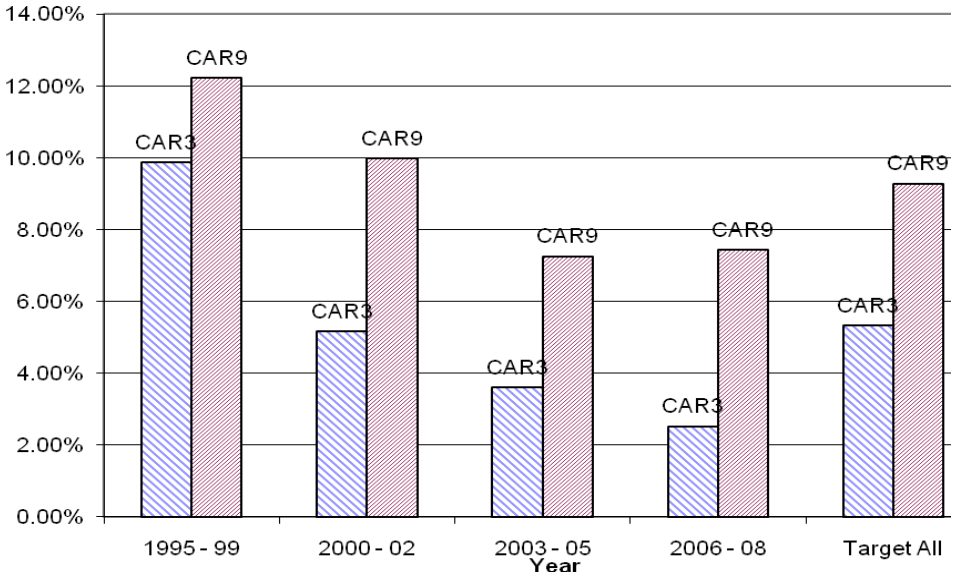
Appendix

Figure I: Acquirer Cumulative Abnormal Returns over Calendar Time



Notes: This figure shows acquirer CAR3 and CAR9 for periods 1995-99 (N=67), 2000-02 (N=111), 2003-05 (N=117), 2006-08 (N=136) and for the whole sample (N=431).

Figure II. Target Cumulative Abnormal Returns over Calendar Time



Notes: This chart depicts target CAR3 and CAR9 for periods 1995-99 (N=23), 2000-02 (N=29), 2003-05 (N=25), 2006-08 (N=20) and for the entire period (N=97)

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