

**GLUCKSMAN FELLOWSHIP PROGRAM STUDENT
RESEARCH REPORTS: 2011-2012**

Samuel Welt

The Debt Ceiling: Economics and Politics

Karen Shortt

Does 'Going Green' Make Economic Sense?

Oren Livne

Secondary Markets for Private Company Shares:
Marketplace Overview and Predictive Capability

Ismael Orenstein

The Impact of Large scale Asset Buybacks on
Relative Valuation of U.S Treasury Securities

WILLIAM L. SILBER, EDITOR

PREFACE

The Glucksman Institute for Research in Securities Markets awards fellowships each year to outstanding second year Stern MBA students to work on independent research projects under a faculty member's supervision. Four research projects completed by the Glucksman Fellows of 2011-2012 are included in this special issue of the Finance Department Working Paper Series. These papers focus on important topics in empirical financial economics.

Samuel Welt, under the supervision of William Silber, analyzes the economic and political factors that determine the magnitude of increases in the debt ceiling voted by Congress. Karen Shortt, under the direction of Aswath Damodaran, investigates the relationship between corporate environmental performance and abnormal stock price movements of a firm. Oren Livne, under the supervision of Alexander Ljungqvist, provides an overview of the evolution of the private company secondary marketplace in the United States, and evaluates the ability of secondary market data to predict share price changes post IPO. Ismael Orenstein, under the supervision of Yakov Amihud, analyzes the impact of the Federal Reserve's Quantitative Easing (QE) program on the relative pricing of treasury securities. These papers, reflecting the research effort of four outstanding Stern MBA students, are summarized in more detail in the Table of Contents on the next page.

William L. Silber, Director
Glucksman Institute

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The U.S. has an overall limit on the amount of federal debt allowed outstanding at any one time. To adjust for rising debt levels over time, Congress has repeatedly raised the debt limit in order to allow additional borrowing. The formal statistical model developed in this paper shows that economic factors, such as recessions and the level of interest rates, play a significant role in the amount that Congress votes to raise the debt ceiling. General political factors, such as whether the votes are taken during an election year, do not affect the magnitude of the debt ceiling increase, but the model shows that votes to raise the debt ceiling taken together with a legislative change to the budget process produce a significantly larger increase in the debt ceiling than otherwise.

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This study focuses on the relationship between corporate environmental performance, as measured by press releases announcing environmental activity, and firm performance, as measured by abnormal stock returns. This paper concludes that there is not a strong statistical relationship between environmental sensitivity and firm performance. Furthermore, it does not appear that market attitudes towards green investment have changed over time or that firm-specific variables influence abnormal returns. Although there is not a strong statistical relationship between all of the press releases studied and abnormal stock returns, there are statistically significant relationships in subsets of the data. In particular, passive press releases and releases for firms in non-customer-facing industries exhibit negative cumulative abnormal returns. This study suggests rationales for these findings and areas for further research.

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The marketplace for private company shares has evolved rapidly over the last few years in response to changing market dynamics and increasing interest in the next generation of large internet-based companies. This paper provides an overview of the evolution of the private company secondary marketplace in the United States, its current players, and the risks and benefits to those involved. The paper then discusses several companies that have transitioned from secondary market transactions to initial public offerings (IPOs). Finally, this paper evaluates the ability of secondary market data to predict share price changes post IPO.

This paper analyzes the impact of the Federal Reserve’s Quantitative Easing (QE) program on the relative pricing of treasury securities, estimated as the spread between the YTM of On-The-Run (OTR) and Off-The-Run (OFR) bonds of the same maturity. By engaging in QE, the Fed purchased over \$900 billion of treasury securities between March/2009 and June/2011. By regressing the OFR-OTR spread against the amount of securities purchased in a given period, it is possible to assess the impact of those purchases on the relative pricing of securities in the yield curve. The results show that the QE program had a statistically significant impact on the OFR-OTR spread and this impact was more pronounced in the aftermath of the Financial Crisis when balance sheet constraints were higher.

**The Debt Ceiling:
Economics and Politics**

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April 2, 2012

I. INTRODUCTION

Since 1917 the U.S. has had an overall limit on the amount of federal debt allowed outstanding at one time. To adjust for rising debt levels over time, Congress has repeatedly raised the debt limit in order to allow additional borrowing.¹ Over the past 40 years, these votes have become especially charged as the federal debt and deficit spending is usually at the forefront of political debates. Part 1 of this paper will provide an overview of the debt ceiling and the process through which Congress raises the debt limit.

Part 2 uses a statistical model of historical debt ceiling votes to examine the factors influencing the magnitude of changes in the debt ceiling legislated by Congress. The model includes economic factors, such as the level of interest rates, and political factors, such as the political makeup of the Presidency, House of Representatives, and Senate, to explain changes in the debt ceiling. The results show that the effects of economic factors far outweigh political considerations except when there are substantial negotiations between the president and Congress to alter the budget process as part of the debt ceiling vote.

Many arguments have been put forth both in support of, and against, the debt ceiling statute.² Supporters argue that the debt ceiling brings attention to the country's fiscal position and forces Congress and the President to take visible actions to monitor spending while allowing further borrowing. Those in opposition argue that the debt ceiling does little to alter spending policies, and has a minimal effect on the amount of federal debt. The uncertainty and administrative burden when the Treasury must take extraordinary actions has potential negative

¹ For a discussion of the treatment of debt in the United States from WWI through the Great Depression, see KENNETH D. GARBADE, *BIRTH OF A MARKET: THE U.S. TREASURY SECURITIES MARKET FROM THE GREAT WAR TO THE GREAT DEPRESSION* (MIT Press, 2012).

² For general information regarding arguments both for and against the debt ceiling, see D. ANDREW AUSTIN & MINDY R. LEVIT, *CONG. RESEARCH SERV., 7-5700, THE DEBT LIMIT: HISTORY AND RECENT INCREASES 3-5* (Jan. 20, 2012).

effects. One additional critique of the debt ceiling is the idea that it can be held “hostage” or used as a “legislative pawn” by the minority legislative party in order to pass other laws or extract additional budget cuts.³ Part 3 of this paper will conclude with two short case studies to highlight some of the specific impacts of politics during past debt crises.

II. OVERVIEW OF THE STATUTORY DEBT CEILING

II.1 The Debt Ceiling and Federal Debt Generally

Unlike almost all other democratic countries, the U.S. places a cap on the total amount of debt allowed outstanding at one time.⁴ This is known as the “statutory debt limit” or “debt ceiling.” Once the amount of outstanding federal debt reaches the debt ceiling, the Treasury can no longer issue additional debt to cover cash shortfalls needed to fund government operations and meet legal obligations. For this reason, between 1950 and 2007, Congress acted 72 times to alter the debt ceiling, 63 of those times raising the limit.⁵ The original debt limit in 1917 was set at \$11.5 billion⁶ and it currently stands at \$16.394 trillion.⁷

Starting with the Revolutionary War, the federal debt was closely related to war spending. While debt would be issued to cover war expenditures, it was typically paid down following the conclusion of a war. Initially, Congress would approve individual issuances of bonds for a specific purpose and provide the appropriate interest rate and term of the bond.⁸ However, during World War I, expenditures grew to unprecedented levels. In order to allow for

³ See Anita S. Krishnakumar, *In Defense of the Debt Limit Statute*, 42 *HARV. J. ON LEGIS.* 135 (2005) for a thorough support of the debt ceiling and data debunking the argument that the debt limit is successfully used as a “legislative pawn.”

⁴ Denmark is the only other democratic country with a debt ceiling. See *Only One Democratic Country, Besides America, Has a Debt Ceiling*, July 19, 2011, <http://abcnews.go.com/blogs/politics/2011/07/only-one-democratic-country-besides-america-has-a-debt-ceiling/> (citing a Moody’s report by Steven Hess).

⁵ The 72 actions affecting the debt ceiling were calculated using the criteria set out in Appendix A.1.

⁶ Second Liberty Bond Act of 1917, Pub. L. No. 65-43, 40 Stat. 288.

⁷ U.S. Office of Management and Budget, *FY2013 Budget of the U.S. Government: Historical Tables*, Table 7-3.

⁸ BIRTH OF A MARKET: THE U.S. TREASURY SECURITIES MARKET FROM THE GREAT WAR TO THE GREAT DEPRESSION at 313-315.

more efficiency in federal borrowing, Congress passed the Second Liberty Bond Act, allowing Treasury the freedom to issue debt up to a set limit.⁹ While Congress was still heavily involved in the process, and still held control over the interest rates of the debt issued, Treasury now had more freedom to determine the amount, terms, and conditions of federal debt to be issued. This was the basis for the modern statutory debt limit.

Almost all outstanding federal debt is subject to the statutory debt limit.¹⁰ Two types of debt make up the debt subject to this statutory limit: debt held by the public and debt held by government agencies. Debt held by the public includes borrowing from state and local governments, private investors, and foreign governments.¹¹ Intragovernmental debt includes liabilities between different parts of the federal government, usually held in trust funds like the Social Security Trust Fund.¹² The total of each of these two types of debt makes up the total debt subject to the debt ceiling.

If outstanding debt reaches the debt limit, the government needs to rely on the current cash balance and incoming revenues to cover obligations.¹³ The process of raising the debt ceiling has at times become extremely contentious and debt ceiling raises could not be enacted before the outstanding federal debt ran up against the statutory limit. In these circumstances, the Treasury Department has some special accounting measures that it can utilize to keep the government running, meet the country's obligations, and buy time until Congress can raise the

⁹ Id. at 313-314. See also Pub. L. No. 65-43, 40 Stat. 288.

¹⁰ A small percentage of federal debt outstanding is not subject to the debt limit. For example, on February 29, 2012, the Total Public Debt Outstanding was \$15,488.891 billion while the Total Public Debt Subject to Limit was \$15,446.261 billion, meaning approximately 0.28% of the Public Debt Outstanding was not subject to the limit. To find the Debt to the Penny on a given date, visit <http://www.treasurydirect.gov/NP/BPDLogin?application=np>; to find the debt subject to the limit on a given date, see Table III-C of the Daily Treasury Statement, available at <http://fms.treas.gov/dts/index.html>.

¹¹ D. ANDREW AUSTIN, CONG. RESEARCH SERV., R41815, OVERVIEW OF THE FEDERAL DEBT 1 (May 11, 2011).

¹² Id. at 5

¹³ MINDY R. LEVIT, CONG. RESEARCH SERV., R41633, REACHING THE DEBT LIMIT: BACKGROUND AND POTENTIAL EFFECTS ON GOVERNMENT OPERATIONS 7 (July 27, 2011).

debt limit. These measures include postponing debt auctions, suspending new issuances of State and Local Government Series Securities, exchanging debt subject to the limit for Federal Financing Bank debt which is not subject to the limit,¹⁴ and suspending investments in certain government trust funds.¹⁵ In 1986, Congress gave explicit legislative approval to the Treasury Department to use certain measures when it determines that a “debt issuance suspension period” is needed to prevent the federal debt from exceeding the limit.¹⁶ While these measures can extend the time by which Congress must raise the debt limit, some of the negative effects include administrative burden, higher borrowing costs, and uncertainty over Treasury cash management.¹⁷

Because the debt ceiling has always been raised when necessary, it is uncertain what actions the government would take if revenues and cash on hand could not cover all government obligations and Treasury exhausted all extraordinary measures.¹⁸ Figure 1 shows the level of the debt ceiling between 1950 and 2007 in nominal and real dollars. The level of the debt ceiling has consistently risen, although the increases have drastically increased in the past 30 years.

¹⁴ Federal Financing Bank debt is an example of debt that is generally not subject to the debt limit. It is, however, subject to its own limit of \$15 billion. OVERVIEW OF THE FEDERAL DEBT at 5.

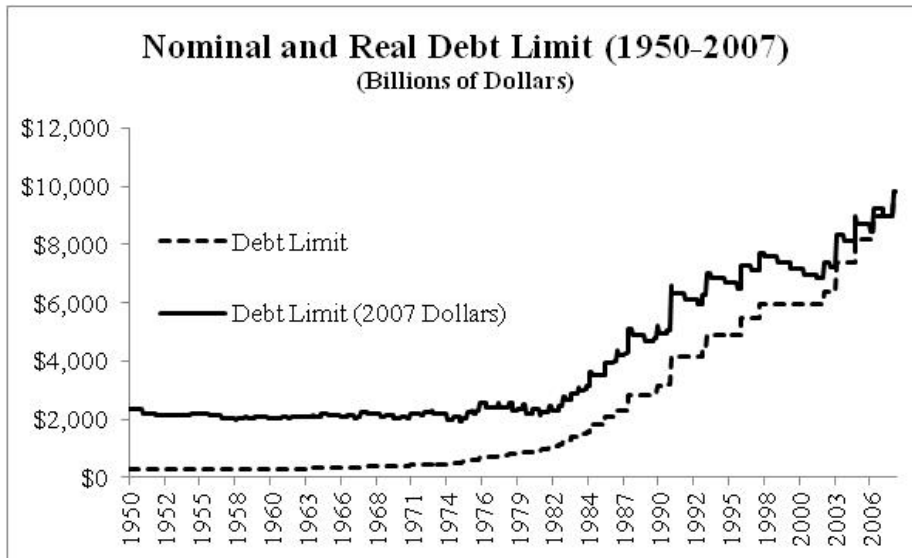
¹⁵ U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-11-203, DELAYS CREATE DEBT MANAGEMENT CHALLENGES AND INCREASE UNCERTAINTY IN THE TREASURY MARKET 7 (Feb. 2011).

¹⁶ Omnibus Budget Reconciliation Act of 1986, Pub. L. No. 99-509, 100 Stat. 1874.

¹⁷ DELAYS CREATE DEBT MANAGEMENT CHALLENGES AND INCREASE UNCERTAINTY IN THE TREASURY MARKET at 10-15.

¹⁸ For more information on the possible actions that the government could take to avoid default see REACHING THE DEBT LIMIT: BACKGROUND AND POTENTIAL EFFECTS ON GOVERNMENT OPERATIONS.

Figure 1: Nominal and Real Debt Limit (1950-2007)



Source: U.S. Office of Management and Budget, *FY2013 Budget of the U.S. Government: Historical Tables*, Table 7-3; U.S. Dep't of Labor, Bureau of Labor Statistics, <http://www.bls.gov/cpi/tables.htm>

II.2 Process to Raise the Debt Ceiling

Because the debt limit is currently codified in Section 3101(b) of Title 31 of the United States Code,¹⁹ adjustments to the debt limit are enacted as amendments to the statute by either replacing the debt limit amount, or adding a temporary limit with an expiration date.²⁰ The Congressional Budget Act of 1974 requires the House and Senate to adopt a concurrent resolution on the budget before considering debt limit legislation.²¹ Even though the budget resolution recommends the appropriate level of the debt limit based on the projected budget surplus or deficit, Congress must enact separate legislation to actually raise the debt limit

¹⁹ 31 U.S.C. § 3101(b) (2012).

²⁰ BILL HENIFF JR., CONG. RESEARCH SERV., RS21519, LEGISLATIVE PROCEDURES FOR ADJUSTING THE DEBT LIMIT: A BRIEF OVERVIEW 1 (Mar. 18, 2010).

²¹ *Id.* at 1.

because a budget resolution does not become law.²² There are three different legislative procedures in which Congress can adjust the amount of the debt limit.²³

Regular Legislative Procedures: The House Ways and Means Committee and the Senate Finance Committee may originate legislation adjusting the debt limit at any time. The measures may be stand-alone, or they may be passed in conjunction with other legislation. The bill, similar to any other legislation, must pass each house of Congress with a majority vote and must then be signed by the President.²⁴

Gephardt Rule Procedures: Debt limit legislation may also be initiated under House Rule XXVIII, commonly known as the Gephardt Rule. The Gephardt Rule was enacted in 1979 as an amendment to a temporary debt limit increase in response to the repeated, and politically contentious, votes to raise the debt ceiling. The purpose of the rule was to place consideration of the debt limit alongside the overall budget policies, while reducing the amount of time spent and number of votes in the House on the issue of raising the limit.²⁵ When a budget resolution is adopted, the Gephardt rule requires that the House clerk automatically transmit to the Senate a joint resolution changing the debt limit by the amount recommended in the budget resolution.²⁶ The resolution is deemed to have passed the House by the same vote as the vote on the budget resolution.²⁷ The Senate does not have a similar procedure, so it must consider the House joint resolution under the regular legislative process.

From the time the rule was established in 1980 through March 2010, the House originated 20 joint resolutions under this procedure, the Senate passed 16 of these joint

²² ALLEN SCHICK, THE FEDERAL BUDGET: POLITICS, POLICY, PROCESS 18-19 (Brookings Institution Press, 3d ed. 2007).

²³ LEGISLATIVE PROCEDURES FOR ADJUSTING THE DEBT LIMIT at 1.

²⁴ Id. at 2.

²⁵ BILL HENIFF JR., CONG. RESEARCH SERV., RL31913, DEVELOPING DEBT-LIMIT LEGISLATION: THE HOUSE'S "GEPHARDT RULE" 1 (Mar. 18, 2010)

²⁶ Id. at 3.

²⁷ Id.

resolutions, and 15 were enacted into law.²⁸ In 14 years during that period (1988, 1990-1991, 1994-2002, 2004, and 2006), the rule did not apply or was not used due to suspension or repeal, or a budget resolution was not finally agreed to.²⁹

Budget Reconciliation Process: The reconciliation process is an optional procedure, and its main purpose is to enhance Congress's ability to change current law affecting revenue, mandatory spending, and debt limit levels to conform with the budget resolution.³⁰ Reconciliation legislation is subject to expedited consideration in both chambers, and in the Senate in particular, debate is limited, amendments must be germane, and extraneous matter is not allowed.³¹ While reconciliation is usually used to adjust revenue and spending levels, the debt limit was changed under reconciliation procedures as part of the Budget Acts of 1986, 1990, 1993, and 1997.³²

III. DATA AND ANALYSIS

III.1 Overview and Description of Debt Ceiling Changes

This study examines the factors affecting the magnitude of Congressional changes to the debt ceiling using a multivariate regression analysis. The time period analyzed is 1950 through 2007. This period avoids the effects of WWII spending as well as the impact of the 2008 World Financial Crisis. The dependent variable is the magnitude of the debt ceiling change in 2007 dollars. Putting everything in 2007 dollars adjusts the debt ceiling for inflation.

The data are based on votes by Congress on the debt ceiling, but eliminate temporary raises of 30 days or less, temporary date extensions of 30 days or less, and other votes meeting

²⁸ LEGISLATIVE PROCEDURES FOR ADJUSTING THE DEBT LIMIT at 3.

²⁹ Id.

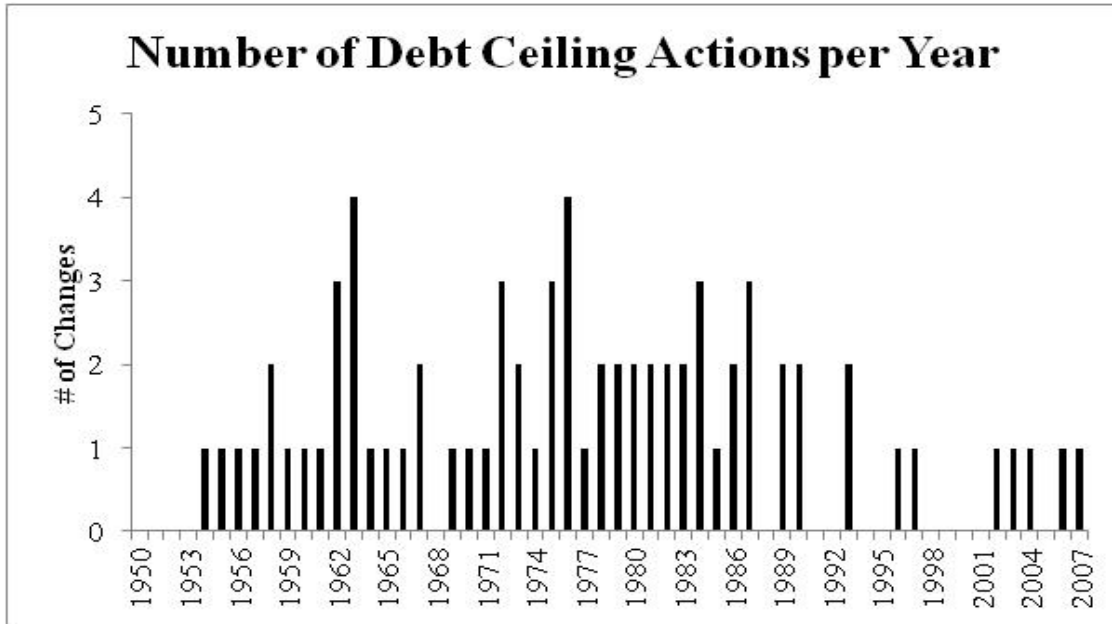
³⁰ Id.

³¹ Schick at 142.

³² LEGISLATIVE PROCEDURES FOR ADJUSTING THE DEBT LIMIT at 4.

specific criteria. Appendix A.1 provides a full explanation of data selection. The outcome of the process results in a dataset of 72 Congressional votes affecting the debt ceiling. During the 58 years in this time period, at least one debt limit change occurred in 43 of the years. As can be seen in Figure 2, more than one debt limit change occurred in twenty years.

Figure 2: Number of Debt Ceiling Actions per Year

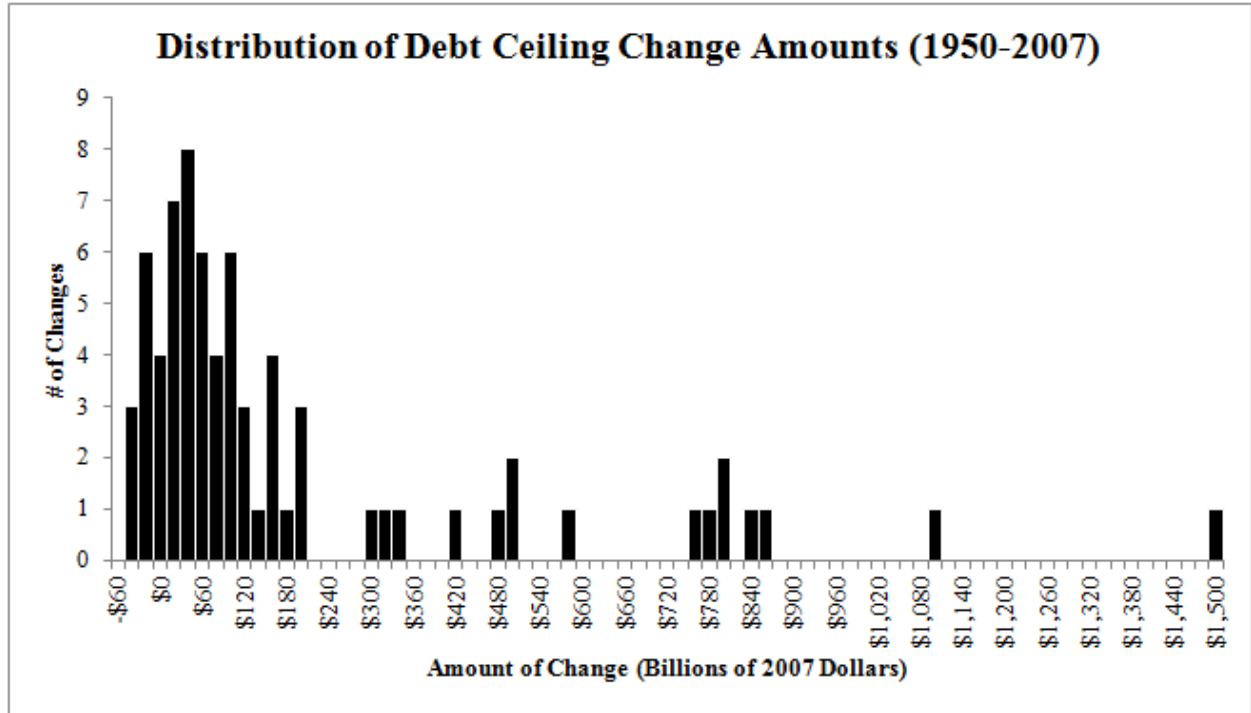


Source: U.S. Office of Management and Budget, *FY2013 Budget of the U.S. Government: Historical Tables*, Table 7-3; See Appendix A.1 for data selection criteria

In 2007 dollars, the minimum debt limit change during this period was a decrease of \$22.87 billion, and the maximum change was \$1,507 billion.³³ The average debt limit change was \$210.76 billion, however, as the distribution of dollar changes in Figure 3 shows, the large range and high standard deviation skews this number. The median debt limit change was \$93.79 billion.

³³ In nominal dollars, the minimum single debt ceiling change was -\$3 billion (in 1956, 1957, and 1962), and the maximum change was \$984 billion (in 2003).

Figure 3: Distribution of Debt Ceiling Change Amounts (1950-2007)



Source: U.S. Office of Management and Budget, *FY2013 Budget of the U.S. Government: Historical Tables*, Table 7-3; U.S. Dep't of Labor, Bureau of Labor Statistics, <http://www.bls.gov/cpi/tables.htm>

III.2 The Model

The main independent variables influencing the magnitude of the debt ceiling change fall into two broad categories – economic factors and political factors. A key hypothesis to be tested is whether political control of both chambers of Congress and the Presidency influences the amount that the debt ceiling is raised. Since Congress does not like to vote for a debt ceiling increase, we might expect a larger increase to avoid repeated votes if the same party controls the White House and Congress.

To determine the potential impact of economic and political factors on debt ceiling legislation, I estimate an equation of the following form:

$$(1) \quad \Delta DC = \beta_0 + \beta_1 * INTRATE_{-1} + \beta_2 * RECESSION + \beta_3 * \Delta DEBT_{-1} + \beta_4 * POLCONTROL + \beta_5 * EY + \beta_6 * EVENT$$

Economic Factors
Political Factors

The definitions and expected signs of the variables are as follows:

- *ΔDC* (dependent variable):
 - The magnitude of the debt ceiling change in billions of 2007 dollars.³⁴
- *INTRATE₋₁*:
 - The average interest rate, in percentage points, on the 10 Year U.S. Treasury bond for the month prior to the occurrence of the debt ceiling vote.
 - The expected sign is negative because higher interest rates result in a higher expense in issuing debt, and typically signal a lower willingness to issue additional debt.
- *RECESSION*:
 - A dummy variable equal to 1 if the debt ceiling vote occurs during a recession, and equal to 0 otherwise.
 - The expected sign is positive because a recession leads to lower tax revenues, higher mandatory government expenditures, and potential stimulus spending.

³⁴ All dollar amounts were adjusted to 2007 dollars by multiplying the nominal dollar amount by the ratio of the 2007 CPI to the applicable year's CPI. CPI data used can be found at <http://www.bls.gov/cpi/tables.htm>.

- *ΔDEBT_t*:
 - The magnitude, in billions of 2007 dollars, that the outstanding federal debt subject to the statutory limit changed in the fiscal year prior to the year that the debt ceiling vote occurred.
 - The expected sign is positive because greater upward pressure on the outstanding debt will result in the need to raise the debt ceiling by a greater amount.

- *POLCONTROL*:
 - A dummy variable equal to 1 if at the time of the vote, the House, Senate, and Presidency were all controlled by the same political party, and is zero otherwise.
 - The expected sign is positive because common control will lead to less negotiation and a desire to avoid numerous future debt ceiling votes.

- *EY*:
 - A dummy variable equal to 1 if the debt ceiling vote occurred during a presidential election year and is zero otherwise.³⁵
 - The expected sign is negative due to the fact that each party will be less willing to raise the debt ceiling when it might have negative political implications in the upcoming presidential election.

- *EVENT*:
 - A dummy variable equal to 1 if the debt ceiling vote occurred in conjunction with a statutory change to the budget process related to deficit reduction, and is zero otherwise. This results in a value equal to 1 for debt ceiling votes that occurred in conjunction with the Balanced Budget and Emergency Deficit Control (Gramm-

³⁵ Two debt ceiling votes occurred during Election Years but after the election took place. These two votes have a value equal to 0 for EY: 12/19/1980 and 11/19/2004.

Rudman-Hollings) Act of 1985; the Balanced Budget and Emergency Deficit Control Reaffirmation (Gramm-Rudman-Hollings II) Act of 1987; the Omnibus Budget Reconciliation Act of 1990; the Omnibus Budget Reconciliation Act of 1993; and the Balanced Budget Act of 1997.³⁶

- The expected sign of this variable is positive because these events usually involve large scale budget negotiations resulting in the need for greater debt to initially cover new programs. In addition, Congress and the President are more willing to raise the debt ceiling by a greater amount because they think that the new budget process will keep debt under control.

III.3 Regression Results

The regression results for equation (1) can be found in Table 1.³⁷ The estimated coefficients show that the impact of economic variables far outweighs the impact of political variables except in cases when debt ceiling raises are enacted in conjunction with statutory changes to the budget process. All three economic variables were statistically significant and had the expected signs. All of the political variables had the expected sign, however, only EVENT was statistically significant.

³⁶ For a list of laws related to the congressional budget process through 2008, see Committee on the Budget of the U.S. House Of Representatives, *Compilation of Laws and Rules Relating to the Congressional Budget Process, as Amended Through November 30, 2008* (Comm. Print 2008) at iii-v. For a list of all debt ceiling bills that were enacted in conjunction with other bills, see Justin Murray, Cong. Research Serv., R41814, *Votes on Measures to Adjust the Statutory Debt Limit, 1978 to Present* (Feb. 1, 2012). The intersection of these two sources results in the inclusions of the following events in the data: Balanced Budget and Emergency Deficit Control (Gramm-Rudman-Hollings) Act of 1985, Pub. L. 99-177; Balanced Budget and Emergency Deficit Control Reaffirmation (Gramm-Rudman-Hollings II) Act of 1987, Pub. L. 100-119; Omnibus Budget Reconciliation Act of 1990, Pub. L. 101-508; Omnibus Budget Reconciliation Act of 1993, Pub. L. 103-66; Balanced Budget Act of 1997, Pub. L. 105-33.

³⁷ See Appendix A.4 for the complete output of the regression program.

Table 1: Summary Regression Results

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	97.536	74.132	1.316	0.193
INTRATE-1	-24.499	9.374	-2.613	0.011
RECESSION	149.683	70.025	2.138	0.036
ΔDEBT-1	0.977	0.145	6.745	0.000
POLCONTROL	23.525	55.005	0.428	0.670
EY	-10.659	61.086	-0.174	0.862
EVENT	448.821	99.376	4.516	0.000
R Square	0.601			
Adjusted R Square	0.564			

Note: Gray cells are statistically significant with a t-Stat greater than 2.

I also used alternative specifications of some of the variables to determine whether the precise definitions altered the results. For example, an average of the previous three months' interest rates was used instead of the previous month only. The previous year budget deficit/surplus was used instead of the change in outstanding debt as a proxy for upward pressure on outstanding debt. Neither of these changes altered the results. For political factors, I tried common party control between the House and Senate regardless of the political party of the President, but this did not yield statistically significant results. I also used House election years instead of Presidential election years but this did not yield a statistically significant result either.

III.4 Implications

The results show a strong statistically significant relationship between the magnitude of the change in the debt ceiling and each of the economic factors. The negative coefficient of INTRATE₋₁ suggests that higher interest rates leading up to a debt ceiling raise will result in a lower magnitude raise of approximately -\$24.5 billion per interest rate percentage point. The positive coefficient of RECESSION suggests that the debt ceiling will be raised by a greater magnitude during a recession than during an expansionary period – an effect of approximately

\$149.7 billion. The positive coefficient of ΔDEBT_{-1} suggests that the greater the increase in federal debt outstanding during the fiscal year prior to a debt ceiling raise, the greater the magnitude of the debt ceiling raise – an effect of approximately \$1.0 billion for every \$1.0 billion increase in debt outstanding. This shows that during the time period analyzed, economic factors played a significant role in the size of debt ceiling increases.

The only systematic political factor influencing the magnitude of the debt ceiling raise is EVENT, the debt ceiling increases that occurred in conjunction with legislated changes in the statutory budget process. The impact of EVENT is quite powerful. The estimated coefficient of EVENT implies that, on average, when the debt ceiling is raised in conjunction with a statutory change to the budget process, the debt ceiling will be raised by approximately \$448.8 billion, everything else held constant. The Gramm-Rudman-Hollings Acts of 1985 and 1987, the Omnibus Budget Reconciliation Acts of 1990 and 1993, and the Balanced Budget Act of 1997 fall into this category.³⁸

IV. CASE STUDIES

The regression model suggests that some political events, like budget negotiations to alter the statutory budget process, have an impact on the magnitude of the debt limit increase, even though more general political effects, like election year votes, have no systematic impact. This section focuses on two historical debt crises to examine more specific ways that political conflict can affect votes on the debt ceiling.

³⁸ See supra Note 36.

Case Study I: 1985 Gramm-Rudman-Hollings Act

In 1981, President Reagan took office committed to three basic policy goals: 1) defense buildup, 2) reduction in taxes, and 3) cuts in domestic program spending.³⁹ The economic growth stimulated by the tax cuts along with the reduced domestic spending was expected to cover the increased defense spending and lost tax revenue.⁴⁰ While defense spending accelerated and dramatic tax cuts were passed, a lack of consensus among Congress prevented the cut in domestic spending that Reagan had expected.⁴¹ In 1985, the approximate \$200 billion annual deficit was recognized as a problem, but the Reagan administration's views that defense buildup must continue and tax hikes were off the table conflicted with the view of House Democrats that additional cuts in domestic spending were not acceptable.⁴²

Through the summer of 1985, various proposals were put forth to rein in the deficit, but disagreements between the President and Congress about how this should be done (even between the Senate Republicans and the President), prevented a deal from being reached.⁴³ In September 1985, a bipartisan group of senators decided to use a vote to increase the debt ceiling as a vehicle to pass what became known as the Gramm-Rudman-Hollings (GRH) Act.⁴⁴ The purpose of the Act was to eliminate the federal deficit in five years by specifying predetermined deficit maximums and implementing automatic across-the-board cuts if targets were not met.

Based on the contentious nature of the bill, debate dragged on despite the threat of reaching the debt limit. Throughout September and October of 1985, Treasury could not fully invest receipts of various trust funds without exceeding the limit, delayed normal auctions of

³⁹ Harry S. Havens, *Gramm-Rudman-Hollings: Origins and Implementation*, *PUB. BUDGETING & FIN.* 6-7 (Autumn 1986).

⁴⁰ *Id.* at 7.

⁴¹ *Id.* at 7.

⁴² *Id.* at 7.

⁴³ *Id.* at 9.

⁴⁴ *Id.* at 9.

federal securities, and was forced to exchange \$5 billion of securities subject to the debt limit with \$5 billion of Federal Financing Bank securities in order to raise cash to pay immediate obligations.⁴⁵

When November arrived, and still no resolution had occurred, Treasury began to disinvest certain holdings of federal debt held in federal trust funds in order to free up more room under the debt ceiling to sell securities to the public.⁴⁶ On November 15, 1985, \$16 billion in interest payments and a refinancing of \$10 billion in notes came due.⁴⁷ Treasury did not have sufficient operating cash, and did not have means available to raise the necessary funds to avoid a default. A temporary increase in the debt limit of \$70 billion through December 6, 1985 allowed Treasury enough borrowing authority to obtain the funds needed to cover the obligations.⁴⁸

The debate over GRH continued beyond the December 6th temporary extension. This caused the debt limit to revert to its previous permanent level which was below the level of outstanding federal debt.⁴⁹ This put Treasury in an extremely tight position, and it again was forced to suspend auctions and stop investing trust fund receipts in government debt.⁵⁰ Finally, on December 12, 1985, the Balanced Budget and Emergency Deficit Control Act of 1985 was enacted, concurrently raising the debt limit to \$2,078.7 billion.⁵¹ Also included in the legislation was authority for Treasury to fully compensate the trust funds for interest losses that occurred

⁴⁵ PHILIP D. WINTERS, CONG. RESEARCH SERV., 98-805E, PUBLIC DEBT LIMIT LEGISLATION: A BRIEF HISTORY AND CONTROVERSIES IN THE 1980S AND 1990S 6-7 (Mar. 28, 2010).

⁴⁶ *Id.* at 7.

⁴⁷ *Id.* at 7.

⁴⁸ *Id.* at 7-8.

⁴⁹ *Id.* at 8.

⁵⁰ *Id.* at 8.

⁵¹ Balanced Budget and Emergency Deficit Control (Gramm-Rudman-Hollings) Act of 1985, Pub. L. 99-177, 99 Stat. 1037.

when Treasury failed to reinvest receipts.⁵² Treasury immediately sold debt to the public to finance federal activities and to compensate these trust funds.⁵³

In response to the measures taken during the GRH crisis, as part of the Omnibus Reconciliation Act of 1986, Congress gave the Treasury Secretary authority to declare a “debt issuance suspension period” or “DISP.”⁵⁴ During a DISP, Treasury is allowed to suspend investment in, or redeem early, certain government securities for selected government funds.⁵⁵ Setting the process, and giving explicit approval of certain measures helped to alleviate uncertainty over what actions Treasury was allowed to take during a debt crisis.

Also in 1986, the Supreme Court struck down the automatic cuts set out in GRH, finding the role of the Comptroller General to be unconstitutional.⁵⁶ While efforts to restore the automatic cuts initially failed, a GRH fix was adopted in 1987 after the debt ceiling raise was again used as a lever.⁵⁷ GRHII fixed the constitutional flaw, revised deficit targets through 1993, and raised the debt limit from \$2.1 trillion to \$2.8 trillion.⁵⁸

Case Study II: 1995-1996 Contract with America Showdown

In 1994, the midterm elections gave the Republican Party a majority of seats in the House for the first time since 1954.⁵⁹ Newt Gingrich, the new Speaker of the House, was instrumental in putting forth a party platform known as the Contract with America, which committed

⁵² Id.

⁵³ A BRIEF HISTORY AND CONTROVERSIES IN THE 1980S AND 1990S at 8.

⁵⁴ Omnibus Budget Reconciliation Act of 1986, Pub. L. No. 99-509, 100 Stat. 1874.

⁵⁵ A BRIEF HISTORY AND CONTROVERSIES IN THE 1980S AND 1990S at 8.

⁵⁶ *Bowsher v. Synar*, 478 U.S. 714 (1986).

⁵⁷ Balanced Budget and Emergency Deficit Control (Gramm-Rudman-Hollings II) Act of 1987, Pub. L. 100-119, 101 Stat. 754.

⁵⁸ Id.

⁵⁹ Schick at 26. See also CHARLES O. JONES, CLINTON AND CONGRESS, 1993-1996: RISK, RESTORATION, AND REELECTION at 96 (University of Oklahoma Press, Norman, Publishing Division of the University, 1999) for details surrounding the unexpected Republican election success.

Republican candidates to certain issues.⁶⁰ As a sign of the political discourse during the election season, Gingrich was quoted in the Washington Post as saying “We will cooperate with anyone, and we’ll compromise with no one.”⁶¹ This “no-compromise” attitude was taken into the first 100 days of the new 1995 Congressional session along with the commitment to the Contract with America.⁶² Gingrich was able to bring all items in the Contract with America to a vote in the House, and all were passed except for a constitutional amendment on term limits.⁶³ However, conflict occurred when President Clinton refused to agree to spending cuts in Medicare, Medicaid, and non-defense spending. Gingrich explicitly threatened to prevent a vote raising the debt ceiling in order to force President Clinton to sign a Republican budget bill.⁶⁴

In the summer of 1995, the debt ceiling stood at \$4.9 trillion. On June 29, 1995, Congress passed a budget resolution calling for the debt ceiling to be raised to \$5.5 trillion.^{65, 66} On July 17, 1995, Treasury Secretary Robert Rubin sent a letter to Congress requesting an increase in the debt ceiling by the end of October, and followed up this letter on September 18, 1995 urging Congress to increase the debt ceiling regardless of a resolution to the budget debate.⁶⁷ Between October 17 and November 8, Treasury postponed auctions of Treasury bills to avoid exceeding the debt limit.⁶⁸ On November 10, Congress passed a temporary debt ceiling increase of \$67 billion, while at the same time repealing the Treasury Secretary’s authority to

⁶⁰ Jones at 108.

⁶¹ Jones at 114.

⁶² Jones at 119.

⁶³ Id.

⁶⁴ ROBERT E. RUBIN & JACOB WEISBERG, IN AN UNCERTAIN WORLD: TOUGH CHOICES FROM WALL STREET TO WASHINGTON at 169 (Random House 2003).

⁶⁵ U.S. GOV’T ACCOUNTABILITY OFFICE, GAO/AIMD-96-130, DEBT CEILING: ANALYSIS OF ACTIONS DURING THE 1995-1996 CRISIS (August 1996), Table 2.1.

⁶⁶ See Section 1 discussing the requirements to list a public debt level in the budget resolution, but the debt limit can only be raised through separate legislation.

⁶⁷ See ANALYSIS OF ACTIONS DURING THE 1995-1996 CRISIS, Table 2.1.

⁶⁸ Id.

utilize certain extraordinary measures.⁶⁹ A stopgap resolution to keep the government running was also passed.⁷⁰ President Clinton vetoed both of these bills.⁷¹ The federal government shut down on November 14 until a temporary resolution was passed and signed on November 20.⁷²

As a result of the failure to increase the debt limit, on November 15, Secretary Rubin declared a debt issuance suspension period in order to raise money to make interest payments that were coming due.⁷³ The fact that Treasury was able to extend the deadline of a default weakened Gingrich's strategy of using the debt ceiling as a lever.⁷⁴ On November 30, Congress passed a Balanced Budget Act, concurrently raising the debt ceiling to \$5.5 trillion.⁷⁵ However, President Clinton again vetoed this bill on December 6.⁷⁶ The temporary resolution expired on December 15, and the government shut down again. At the beginning of January, a new continuing resolution was passed, ending the government shut down on January 6, 1996.⁷⁷

However, a debt ceiling agreement still had not been reached. Treasury again notified Congress that additional extraordinary measures would be needed without a debt ceiling raise.⁷⁸ Specifically, \$30 billion in Social Security payments would not be paid. In order to avoid missing Social Security payments without raising the debt ceiling, Congress authorized Treasury

⁶⁹ Id.

⁷⁰ Adam Clymer, *House Approves Stopgap Budget and Higher Debt*, N.Y. TIMES, Nov. 11, 1995, <http://www.nytimes.com/1995/11/11/us/house-approves-stopgap-budget-and-higher-debt.html>.

⁷¹ Adam Clymer, *Battle Over The Budget: The Overview; President Vetoes Stopgap Budget; Shutdown Looms*, N.Y. TIMES, Nov. 14, 1995, <http://www.nytimes.com/1995/11/14/us/battle-over-budget-overview-president-vetoes-stopgap-budget-shutdown-looms.html>.

⁷² Todd S. Purdum, *Battle Over The Budget: The Overview; President and G.O.P. Agree to End Federal Shutdown and to Negotiate a Budget*, N.Y. TIMES, Nov. 20, 1995, <http://www.nytimes.com/1995/11/20/us/battle-over-budget-overview-president-gop-agree-end-federal-shutdown-negotiate.html>.

⁷³ See ANALYSIS OF ACTIONS DURING THE 1995-1996 CRISIS, Table 2.1.

⁷⁴ Rubin at 172.

⁷⁵ See ANALYSIS OF ACTIONS DURING THE 1995-1996 CRISIS, Table 2.1.

⁷⁶ Todd S. Purdum, *As Long Promised, President Vetoes the G.O.P. Budget*, N.Y. TIMES, Dec. 7, 1995, <http://www.nytimes.com/1995/12/07/us/as-long-promised-president-vetoes-the-gop-budget.html>.

⁷⁷ Adam Clymer, *Congress Votes to Return 760,000 to Federal Payroll and Resume Some Services; Step is Temporary*, N.Y. TIMES, Jan. 6, 1996, <http://www.nytimes.com/1996/01/06/us/congress-votes-return-760000-federal-payroll-resume-someservices-step-temporary.html>.

⁷⁸ See ANALYSIS OF ACTIONS DURING THE 1995-1996 CRISIS, Table 2.1.

to issue debt that was exempt from the debt limit to make the payments.⁷⁹ Finally, on March 29, 1996, the debt ceiling was raised to \$5.5 trillion and Treasury began to restore the appropriate trust funds for the losses incurred during the debt crisis.⁸⁰

While the debt crisis ended in March of 1996, the budget debate was not resolved until August 1997 when President Clinton and Congress agreed to a seven year balanced budget plan made up of both spending cuts and tax increases.⁸¹ The Budget Act included a debt ceiling raise from \$5.5 trillion to \$5.95 trillion which was expected to last until December 1999, but actually lasted until June 2002.⁸²

V. CONCLUSION

The formal statistical model developed above shows that economic factors, such as recessions and the level of interest rates, play a significant role in Congressional votes to raise the debt ceiling. General political factors, such as whether the votes are taken during an election year, do not affect the magnitude of the debt ceiling increase, but the model shows that votes to raise the debt ceiling taken together with a legislative change to the budget process produce a significantly larger increase in the debt ceiling than otherwise.

⁷⁹ See ANALYSIS OF ACTIONS DURING THE 1995-1996 CRISIS, Table 2.1.

⁸⁰ Contract with America Advancement Act of 1996, Pub. L. No. 104-121, 110 Stat. 875 (increasing the debt limit to \$5,500 billion).

⁸¹ "Budget Reconciliation, 1997 Legislative Overview." In *Congress and the Nation, 1997-2001*, vol. 10, 48. Washington, DC: CQ Press, 2002. <http://library.cqpress.com/catn/catn97-97-6343-324298>.

⁸² "Reconciliation Spending Cuts, 1997 Legislative Chronology." In *Congress and the Nation, 1997-2001*, vol. 10, 50. Washington, DC: CQ Press, 2002. <http://library.cqpress.com/catn/catn97-97-6343-324301>.

APPENDIX

A.1 DATA SELECTION CRITERIA

Historical Table 7.3 from the Office of Management and Budget details all actions affecting the statutory debt limit from 1940 to the Present. Data used in this study was selected from Table 7.3 based on the following criteria:

	<u>Criteria Description</u>	<u>Reasoning and Explanations</u>
1	Excluded Actions before 1950 and after 2007	Reasoning: To eliminate any effects of World War II and the Financial Crisis of 2008
2	Excluded Temporary Raises 30 Days or Less	Reasoning: To eliminate raises with the sole purpose of buying more time until a more permanent action could be taken
3	Excluded Temporary Date Extensions of 30 Days or Less	Reasoning: To eliminate date extensions with the sole purpose of buying more time until a more permanent action could be taken
4	Date Extensions Greater than 30 days were included as a \$0 Raise	Reasoning: To include Congress' conscious decision not to let a temporary extension expire, but not to raise the amount of the limit
5	Excluded Temporary Reversions of 30 Days or Less	Reasoning: To eliminate reversions that occurred when a decision could not be reached, but an action rectified the situation promptly <ul style="list-style-type: none"> ▪ E.g. In 1977, the permanent portion of the debt limit was \$400B, and the temporary limit was \$300B. On 9/30/77, the temporary limit expired, and the total debt limit reverted from \$700B to \$400B. On 10/4/77 the debt limit was raised to \$752B. The study views this event as a \$52B raise in the debt limit, ignoring the less than 30 day reversion. ▪ Note: If after a temporary reversion the limit was raised to less than the previous limit, this was counted as a decrease for the difference.
6	Excluded Any Raises Fully Superseded by a Subsequent Raise	Reasoning: The set debt limit never went into effect, and the subsequent debt limit raise was based on the previous debt limit level <ul style="list-style-type: none"> ▪ For example: <ul style="list-style-type: none"> ▪ <u>6/1/62</u>: Congress set the debt limit for the date period 6/25/63 through 6/30/63. ▪ <u>5/29/63</u>: Before the initial raise became effective, a new debt limit was set.

	<u>Criteria Description</u>	<u>Reasoning and Explanations</u>
7	Used Statute Approval Date to determine Independent Variables if multiple staged raises were approved in one vote	<ul style="list-style-type: none"> ▪ Reasoning: Study is testing the decision-making process at the time of the vote to enact the debt limit raise ▪ E.g. If on 6/30/76, the debt limit was set for two subsequent phases, 7/1/76 through 3/31/77 and 4/1/77 through 9/30/77, the makeup of Congress for the second raise beginning in 1977 is tested at the date of the vote in 1976.
8	If a Permanent Raise and Temporary Raise were approved together, the total amount of the raise was used in calculating the increase	<p>Reasoning: The overall level of the limit, as long as the temporary portion meets the criteria discussed above, is effectively the total of the two portion raises</p> <ul style="list-style-type: none"> ▪ E.g. If Congress raised the Permanent portion of the debt limit from \$358B to \$365B, and at the same time raised the Temporary portion of the debt limit from \$7B to \$12B, the data counts this as a \$12B total increase in the debt limit.
9	Excluded Actions Not Affecting the Limit Amount	Reasoning: In 1996, two actions exempted certain securities from counting towards the statutory debt limit in order to temporarily prevent default during a debt crisis. This data was excluded from the study.
10	Adjusted Debt Limit Amount enacted 2/19/1975 as 89 Stat. 5 from \$577B to \$531B	Reasoning: Independent analysis of 89 Stat. 5 shows the proper debt limit based on the statute should be \$531B

A.2 DATA SAMPLE

The data sample for this study, compiled using the data criteria discussed in Appendix A.1, is included below.

Statute Approval Date	Debt Limit Amount (Nominal Dollars)	ADC (2007 Dollars)	INTRATE-1	RECESSION	ADEBT-1 (2007 Dollars)	POLCONTROL	EY	EVENT	Statute Approval Date	Debt Limit Amount (Nominal Dollars)	ADC (2007 Dollars)	INTRATE-1	RECESSION	ADEBT-1 (2007 Dollars)	POLCONTROL	EY	EVENT
8/28/1954	281	46.25	2.30	0	54.26	1	0	0	6/30/1976	700	65.59	7.90	0	227.48	0	1	0
6/30/1955	281	0.00	2.76	0	39.76	0	0	0	10/4/1977	752	177.92	7.34	0	318.30	1	0	0
7/9/1956	278	-22.87	3.00	0	22.97	0	1	0	3/27/1978	752	0.00	8.03	0	268.27	1	0	0
7/1/1957	275	-22.14	3.80	0	-13.18	0	0	0	8/3/1978	798	146.28	8.64	0	268.27	1	0	0
2/26/1958	280	35.87	3.09	1	-11.06	0	0	0	4/2/1979	830	91.39	9.12	0	231.28	1	0	0
9/2/1958	288	57.40	3.54	0	-11.06	0	0	0	9/29/1979	879	139.94	9.03	0	231.28	1	0	0
6/30/1959	295	49.88	4.31	0	45.02	0	0	0	6/28/1980	925	115.75	10.18	1	156.86	1	1	0
6/30/1960	293	-14.01	4.35	1	50.05	0	1	0	12/19/1980	935.1	25.41	12.68	0	156.86	1	0	0
6/30/1961	298	34.67	3.71	0	9.86	1	0	0	2/7/1981	985	113.82	12.57	0	204.09	0	0	0
3/13/1962	300	13.73	4.04	0	17.20	1	0	0	9/30/1981	1079.8	216.24	14.94	1	204.09	0	0	0
7/1/1962	308	54.93	3.91	0	17.20	1	0	0	6/28/1982	1143.1	136.01	13.62	1	205.51	0	0	0
7/1/1962	305	-20.60	3.91	0	17.20	1	0	0	9/30/1982	1290.2	316.06	13.06	1	205.51	0	0	0
5/29/1963	307	13.55	3.97	0	62.24	1	0	0	5/26/1983	1389	205.68	10.40	0	309.61	0	0	0
5/29/1963	309	13.55	3.97	0	62.24	1	0	0	11/21/1983	1490	210.26	11.54	0	309.61	0	0	0
8/27/1963	309	0.00	4.02	0	62.24	1	0	0	5/25/1984	1520	59.87	12.63	0	489.29	0	1	0
11/26/1963	315	40.66	4.11	0	62.24	1	0	0	7/6/1984	1573	105.77	13.56	0	489.29	0	1	0
6/29/1964	324	60.20	4.20	0	51.15	1	1	0	10/13/1984	1823.8	500.49	12.52	0	489.29	0	1	0
6/24/1965	328	26.33	4.21	0	37.86	1	0	0	12/12/1985	2078.7	491.18	9.78	0	389.18	0	0	1
6/24/1966	330	12.80	4.78	0	36.49	1	0	0	8/21/1986	2111	61.11	7.30	0	483.28	0	0	0
3/2/1967	336	37.25	4.63	0	13.87	1	0	0	10/21/1986	2300	357.55	7.45	0	483.28	0	0	0
6/30/1967	365	180.03	4.85	0	13.87	1	0	0	5/15/1987	2320	36.50	8.02	0	543.33	0	0	0
4/7/1969	377	67.80	6.30	0	151.28	0	0	0	8/10/1987	2352	58.41	8.45	0	543.33	0	0	0
6/30/1970	395	96.19	7.91	1	42.78	0	0	0	9/29/1987	2800	817.69	8.76	0	543.33	0	0	1
3/17/1971	430	179.18	6.11	0	88.14	0	0	0	8/7/1989	2870	117.05	8.02	0	439.67	0	0	0
3/15/1972	450	99.21	6.08	0	133.36	0	1	0	11/8/1989	3122.7	422.54	8.01	0	439.67	0	0	0
7/1/1972	450	0.00	6.11	0	133.36	0	1	0	8/9/1990	3195	114.70	8.47	1	406.16	0	0	0
10/27/1972	465	74.41	6.55	0	133.36	0	1	0	11/5/1990	4145	1,507.08	8.72	1	406.16	0	0	1
7/1/1973	465	0.00	6.90	0	144.35	0	0	0	4/6/1993	4370	322.85	5.98	0	595.98	1	0	0
12/3/1973	475.7	49.97	6.73	1	144.35	0	0	0	8/10/1993	4900	760.49	5.81	0	595.98	1	0	1
6/30/1974	495	81.17	7.58	1	142.49	0	0	0	3/29/1996	5500	792.89	5.81	0	379.95	0	1	0
2/19/1975	531	138.74	7.50	1	71.15	0	0	0	8/5/1997	5950	581.33	6.22	0	333.80	0	0	1
6/30/1975	577	177.28	8.06	0	71.15	0	0	0	6/28/2002	6400	518.64	5.16	0	165.28	0	0	0
11/14/1975	595	69.37	8.14	0	71.15	0	0	0	5/27/2003	7384	1,108.83	3.96	0	494.01	1	0	0
3/15/1976	627	116.61	7.79	0	227.48	0	1	0	11/19/2004	8184	878.10	4.10	0	649.31	1	0	0
6/30/1976	636	32.80	7.90	0	227.48	0	1	0	3/20/2006	8965	803.24	4.57	0	570.84	1	0	0
6/30/1976	682	167.62	7.90	0	227.48	0	1	0	9/29/2007	9815	850.00	4.67	0	564.88	0	0	0

A.3 SUMMARY STATISTICS

Table A.3-1: Descriptive Statistics of Variables

Dependent Variable	Minimum	Median	Average	Maximum	Standard Deviation
ΔDC (SBN₂₀₀₇)	-22.87	93.79	210.76	1,507.08	301.75

Numerical Independent Variables	Minimum	Median	Average	Maximum	Standard Deviation
INTRATE-1 (%)	2.30	6.82	7.03	14.94	3.02
ΔDEBT-1 (SBN₂₀₀₇)	-13.18	184.69	228.36	649.31	193.25

Binary Independent Variables	# of Occurrences	% Occurrence out of 72 Data Points
RECESSION	12	16.7%
POLCONTROL	26	36.1%
EY	15	20.8%
EVENT	5	6.9%

Table A.3-2: Independent Variable Correlation Table

	INTRATE-1	RECESSION	ΔDEBT-1	POLCONTROL	EY	EVENT
INTRATE-1	1.00	0.27	0.37	-0.35	0.13	0.08
RECESSION		1.00	-0.14	-0.26	-0.05	0.02
ΔDEBT-1			1.00	-0.13	0.00	0.32
POLCONTROL				1.00	-0.24	-0.09
EY					1.00	-0.14
EVENT						1.00

A.4 REGRESSION RESULTS

Table A.4-1: Regression Results

<i>Regression Statistics</i>					
Multiple R		0.775			
R Square		0.601			
Adjusted R Square		0.564			
Standard Error		199.146			
Observations		72			

<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	6	3886834.284	647805.714	16.334	0.000
Residual	65	2577832.295	39658.958		
Total	71	6464666.579			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	97.536	74.132	1.316	0.193
INTRATE-1	-24.499	9.374	-2.613	0.011
RECESSION	149.683	70.025	2.138	0.036
Δ DEBT-1	0.977	0.145	6.745	0.000
POLCONTROL	23.525	55.005	0.428	0.670
EY	-10.659	61.086	-0.174	0.862
EVENT	448.821	99.376	4.516	0.000

Note: Gray cells are statistically significant with a t-Stat greater than 2.

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Does 'Going Green' Make Economic Sense?

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I. INTRODUCTION

The emission of greenhouse gases from large corporations has contributed to a number of environmental problems, most notably climate change. As the problems associated with environmentally irresponsible actions become more severe (the eight warmest years on record since 1850 have all occurred since 1998), stakeholders are increasingly pressuring companies to ‘go green.’¹

Companies have responded to this growing concern by dedicating a portion of their corporate budgets to environmentally friendly initiatives. Many U.S. companies now track their environmental progress in annual sustainability reports, hire senior executives to fill sustainability posts, and construct new buildings according to environmental specifications. In addition, companies have spent increased attention on developing new products tailored to eco-minded customers and implementing new, environmentally friendly processes. Despite the significant outflow of capital required to institute these environmental initiatives, it is unclear whether or not these investments have generated financial returns.

II. PREVIOUS WORK

There are a number of theories surrounding the relationship between corporate social performance, of which environmental performance is a large part, and firm performance. Previous research on this topic has elicited inconclusive results, indicating that this relationship may be positive, neutral, or negative (Sánchez and Sotorrío, 2007).

Researchers in favor of a positive correlation stress that strong environmental performance can enhance a firm’s reputation, improving its competitive advantage

¹ “Climate Change: Basic Information.” Environmental Protection Agency. 20 July 2011. <<http://www.epa.gov/climatechange/basicinfo.html>>.

(Covin and Miles, 2000). In addition, firms that invest in environmental initiatives may avoid future fines, crises, and liabilities (Klassen and McLaughlin, 1996). The reduction of waste associated with green activity can reduce costs and increase profitability (Schmidheiny, 1992). A positive correlation could also imply that only profitable firms have the cash flow required for green investment (Ullman, 1985).

Proponents of a neutral relationship between environmental and firm performance claim that too many factors impact social and firm performance to elicit any strong relationship (Sánchez and Sotorrío, 2007). Researchers in favor of this theory attribute the existence of positive or negative relationships in previous studies to problems associated with testing this hypothesis. Specifically, researchers have used different models and defined social and firm performance differently. To complicate matters further, they have also analyzed different firms across different time periods (Ullman, 1985).

Environmental performance may be negatively correlated with firm performance because of the higher costs associated with investing in and maintaining environmental programs (Sánchez and Sotorrío, 2007; Friedman, 1970). Furthermore, investments in environmental initiatives could prevent companies from undertaking more profitable investments (Palmer, Oates, & Portney, 1995).

III. THE TRADE OFF ON GOING GREEN: WEIGHING THE PLUSES AND MINUSES

Although previous research has produced discordant results regarding the relationship between environmental and firm performance, this paper will argue that these two factors are negatively correlated, both due to greening's high price tag and due

to the pattern of its financial returns. Going green forces companies to make a crucial trade off. Corporate greening can produce economic benefits in the form of waste reduction, crisis prevention, and reputation enhancement, but these advantages are offset by the higher cost of undertaking and maintaining environmental initiatives. It can be difficult to determine if the economic benefits of corporate greening outweigh its high cost because green investments are typically accompanied by large initial outflows of capital and less quantifiable returns in the future. This paper will argue that the market will not reward companies making large investments now in the hopes of enjoying unquantifiable payoffs in the future. On average, firms investing in environmental activities will experience negative returns.

The relationship between environmental and firm performance is not stable across time. Rather, it is likely to vary based on the amount of pressure a firm faces to go green and the quality of the firm's environmental investment options. Increased public pressure could lead firms to overestimate the benefits and underestimate the costs of greening in order to justify their investments. Additionally, companies that have dedicated a large portion of their budgets to greening may be required to invest in environmental projects, regardless of their quality. As time goes on and the best green projects are undertaken, companies may begin investing in second-tier projects with less attractive returns. Increased public pressure, coupled with a lack of attractive investment opportunities, could make the costs of greening outweigh the benefits.

The relationship between environmental and firm performance is likely to vary based on the type of company engaging in green activity, as well, since differences in firms alter the trade off inherent in green investment. Specifically, firms in customer

facing industries are likely to experience larger benefits from reputation enhancement while firms in manufacturing industries are likely to experience larger benefits from waste reduction and crisis prevention. This paper will attempt to identify which type of benefit is more likely to outweigh the high costs of greening. Firms facing different tax rates are also likely to experience differing degrees of green benefits. Environmental tax credits are much more enticing for firms facing higher tax rates than lower tax rates, a fact that could induce high tax rate firms to invest in poorer environmental projects. However, environmental tax subsidies for companies that operate in high tax rate industries are more likely to generate significant financial benefits. On a more granular level, the relationship between environmental and firm performance could vary by a number of firm-specific factors, such as firm size, shareholder power, and profitability. These factors are all likely to influence the trade off associated with greening.

The relationship between environmental and firm performance is also likely to vary based on the type of environmental investment being made. Announcements of active green investment, such as the launch of a new environmentally friendly product or process, are typically accompanied by large initial outflows of capital. As discussed earlier, it is difficult to conduct a detailed cost benefit analysis on these investments, since future payoffs are less concrete. On the other hand, announcements of passive green activity, such as the receipt of an environmental award or the launch of an environmental strategy, are even more ambiguous. Although this type of green activity does not typically require an immediate outflow of capital, it indicates the presence of both past and future environmental commitments. However, it is likely that active green activity will lead to larger negative returns, on average, than passive green activity

because more concrete capital outflows represent stronger commitments to the environment.

IV. HYPOTHESES

This paper will attempt to prove that there is a negative correlation between environmental performance and firm performance, as measured by abnormal stock returns. The advantages of an enhanced reputation, liability avoidance, and waste minimization, are outweighed by the disadvantages of increased operational costs and limited investment opportunities that result from environmental investment.

H1: Corporate environmental investment, determined by the announcement of a new, green initiative, affects firm performance. In particular, the announcement of a green initiative will result in negative abnormal stock returns.

This basic hypothesis can be extended to determine if the market's attitude towards environmental investment has changed over time. Green activity is much more commonplace now than it has been in the past. As companies feel pressure to increase their green budgets, they may begin to invest in less desirable environmental projects. Cumulative stock returns may also be influenced by the proliferation of environmental news in the press. Historic Google trend data for the terms "global warming" and "carbon emissions" will be factored into this study to account for variation in the amount of environmental news in the popular press.

H2: The relationship between environmental and firm performance has changed over time. Specifically, more recent announcements of environmental activity will be accompanied by larger negative abnormal stock returns than older announcements.

Cumulative stock returns will also be correlated to the amount of environmental news in the press.

This paper will attempt to prove that the strength of the relationship between environmental and firm performance varies across industries, as well. Environmental investment in historically ‘dirty’ industries, such as petroleum, may be treated with skepticism; however, firms in these industries are more likely to benefit from “resource conservation, crisis prevention, and the establishment of new competitive barriers” (Klassen and McLaughlin, 1996). Firms operating in ‘dirty industries,’ generally referred to as non-customer facing industries in this paper, are more likely to benefit from green investment because their operations tend to have a larger impact on the environment. On the other hand, firms operating in customer-facing industries are more likely to enjoy the reputation benefits associated with increased environmental performance.

Cumulative stock returns may also vary by industry due to differing tax rates across industries. Firms that operate in industries with higher average tax rates will benefit more from government subsidies for environmental investment. The desire to gain tax subsidies may induce firms with high effective tax rates to invest in unprofitable environmental projects.

H3: The effect of corporate environmental investment on firm performance varies by industry. The degree of abnormal stock returns will differ between companies that operate in non-customer facing industries and those that operate in customer-facing industries. Cumulative stock returns will also be correlated to firms’ effective tax rates.

This paper will also attempt to prove that the strength of the relationship between environmental and firm performance will vary based on the type of green activity a firm

engages in. Environmental investments that require an outflow of capital, such as the launch of a new product or the implementation of a new process, will generate larger negative abnormal returns than announcements that are not accompanied by outflows of capital. The market will penalize active press releases, those accompanied by capital outflows, more aggressively than passive releases because they display a stronger, more tangible commitment to the environment.

H4: Announcements of active green investment, such as the development of a new product or process, will generate larger negative abnormal returns than announcements of passive green investment, such as the receipt of a green award or the disclosure of a new, environmental strategy.

Lastly, this paper will attempt to demonstrate that cumulative stock returns are correlated to firm-specific factors, namely size, shareholder power, profitability, and effective tax rate.

Larger firms are more likely to invest in environmental initiatives because they are under more public scrutiny (Stanwick and Stanwick, 1998). In fact, larger firms have historically scored higher on *Fortune's* Corporate Reputation Index (Fombrun and Shanley, 1990). Larger firms, under pressure to maintain their strong environmental reputation, may be more likely to invest in unprofitable green initiatives. Trailing 12-month revenues, as of the most recent fiscal year end, will be used as a proxy for firm size while trading volume, as of the most recent fiscal year end, will be used as a proxy for public interest.

Large degrees of stakeholder power will increase environmental investment because companies are more likely to respond to the desires of stakeholders when power

is consolidated. For this reason, as stakeholder power increases, environmental investment will also increase (Ullman, 1985). Conversely, when shareholder power is consolidated amongst insiders, companies are less likely to invest in unprofitable environmental projects solely to appease their shareholders. Percentages of insider holdings, as of the most recent fiscal year end, will be used to measure the relative power of insiders.

More profitable firms are able to devote more attention to environmental initiatives. In addition, they are able to spend the money required to institute and maintain costly environmental programs (Ullman, 1985). More profitable firms also have a history of choosing profitable projects. They are less likely to undertake an unprofitable environmental investment due to public or shareholder pressures. For the purpose of this paper, return on capital, as of the most recent fiscal year end, will be used as a measure of firm profitability.

Tax subsidies are an important factor in corporate environmental investment decisions. Federal, state, and local tax credits are available to firms that invest in green initiatives. Companies with high tax rates may be more willing to institute unprofitable environmental initiatives in order to receive tax subsidies than companies with lower tax rates. Effective tax rates, as of the most recent fiscal year end, will be used to measure firm-specific tax levels.

H5: Cumulative stock returns will be correlated to firm size, shareholder power, profitability, and the effective tax rate. As firm size and the effective tax rate increase, cumulative stock returns will also increase. As firm profitability and insider holdings increase, cumulative stock returns will decrease.

V. RESEARCH METHODOLOGY

This paper relies on event study methodology to determine the relationship between environmental and firm performance. Event study methodology was used to extract the portion of stock returns that could be attributed to firm-specific events, namely the release of an announcement detailing environmental activity, rather than to changes in the market as a whole.

Press releases outlining green activity were used to measure environmental performance. These press releases could be broadly categorized as announcing 1) the launch of a new eco-friendly product, 2) the introduction of a new eco-friendly process, 3) the receipt of an environmental award, and 4) the communication of eco-friendly goals and strategies. Cumulative stock returns served as a measure of firm performance.

The release date of the announcement was treated as the event date. Cumulative stock returns, cumulative market returns, and cumulative risk free rates were calculated for the period beginning 2 days before the event date and ending 3 days after the event date. Bloomberg equity pricing data was used to calculate cumulative stock returns, S&P returns were used to calculate cumulative market returns, and Ken French's database, which amasses data from Ibbotson and Associates, Inc., was used to calculate cumulative risk-free rates.² The cumulative stock return, net of the cumulative risk free rate, was regressed against the cumulative market return, net of the risk free rate, in order to determine an alpha, or the amount of excess return that cannot be attributed to the market. This data was then segmented by year, industry, and type of press release for hypotheses 2 – 4.

² Kenneth French. "Fama/French Factors." 12 Dec 2011.
<http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#Research>.

A multivariate regression was used to analyze the relationship between cumulative stock returns and independent, firm-specific variables, such as trailing 12-month revenue, trading volume, percentage of insider holdings, return on capital, and effective tax rate. These independent variables were obtained from Value Line. The effective tax rate and percent changes in weekly Google trend data for the terms “global warming” and “carbon emissions” were used as independent variables in additional regressions.

VI. DATA SELECTION

The data set consisted of 619 environmental press releases. It was comprised of 155 unique US-based publicly traded companies across 10 industries from 2006 to 2011. The data set is summarized below.

Figure 1: Data Segmentation by Industry and Year

Industry	Count
Consumer Discretionary	154
Consumer Staples	107
Industrials	103
Information Technology	99
Materials	61
Utilities	31
Health Care	27
Financials	15
Telecommunication Services	14
Energy	8
Total	619

Year	Count
2006	61
2007	73
2008	77
2009	132
2010	126
2011	150
Total	619

A subset of the original data set was used to analyze the relationship between cumulative stock returns and independent, firm-specific variables. This data set consisted of 346 environmental press releases. It was comprised of 111 unique US-based publicly traded companies across 10 industries from 2006 to 2010. The data set is summarized below.

Figure 2: Data Segmentation by Industry and Year, Subset

Industry	Count	Year	Count
Information Technology	78	2006	61
Consumer Discretionary	69	2007	68
Consumer Staples	56	2008	77
Industrials	51	2009	127
Materials	34	2010	13
Utilities	21	2011	0
Health Care	12	Total	346
Telecommunication Services	10		
Financials	9		
Energy	6		
Total	346		

VII. RESULTS

H1: The regression indicated a negative, albeit statistically weak, relationship between environmental performance and firm performance. The regression yielded an alpha, or excess return not attributable to the market, equal to -0.003 with a p-value of 0.151 (see Exhibit 1).

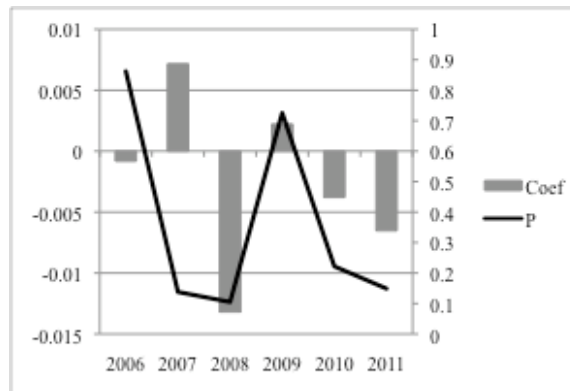
H2: Abnormal returns declined from 0.007 in 2007 to -0.013 in 2008 and from -0.004 in 2010 to -0.007 in 2011. The regression did not yield a significant alpha for 2006 or 2009. Subsequent regressions did not yield significant alphas for the periods 2006 – 2008 or 2009 – 2011 (see Exhibit 2).

Figure 3: Regression Results: Segmentation by Year

Year	Coef	P
2006	-0.000818	0.862
2007	0.007163	0.138
2008	-0.013185	0.105
2009	0.00222	0.725
2010	-0.003783	0.222
2011	-0.006524	0.149
2006 - 2008	-0.002404	0.499
2009 - 2011	-0.003226	0.239

As the graph below shows, there is no relationship between the year in which an environmental initiative is announced and the degree of abnormal returns.

Figure 4: Regression Coefficients and P-Values by Year



There also appears to be no relationship between the level of public concern for the environment, as measured by changes in weekly Google trend data for the terms “global warming” and “carbon emissions,” and abnormal returns (see Exhibit 3). Both independent variables were not statistically significant.

Figure 5: Regression Results: “Global Warming” and “Carbon Emissions”

Predictor	Coef	P
"Carbon Emissions"	0.003898	0.604
"Global Warming"	-0.01031	0.426

H3: On the other hand, there does appear to be a strong relationship between the type of environmental announcement and the presence of abnormal returns. While active press releases, those announcing a new environmental product or process, did not exhibit a significant abnormal return, passive press releases, those announcing a new environmental goal or award, did exhibit a significant abnormal return. In fact, the passive regression yielded an alpha of -0.008 with a p-value of 0.015 (see Exhibit 4).

Figure 6: Regression Results: Active and Passive

Type of Release	Count	Coef	P
Active	306	0.001894	0.491
Passive	313	-0.008111	0.015

H4: The type of industry a firm operates in is also related to the presence of abnormal stock returns. Customer facing industries, defined in this paper as consumer discretionary, consumer staples, information technology, health care, financials, and telecommunication services, did not exhibit abnormal returns. However, environmental press releases of non-customer facing industries, defined in this paper as industrials, materials, utilities, and energy, were met with significant abnormal returns (see Exhibit 5). The non-customer facing regression yielded an alpha of -0.009 with a p-value of 0.043 (see Exhibit 6).

Figure 7: Regression Results: “Customer-Facing” and “Non-Customer Facing”

Industry Category	Coef	P
Customer Facing	0.000057	0.980
Non-Customer Facing	-0.009296	0.043

There is also a strong statistical relationship between the effective tax rate of a firm and cumulative stock returns. Effective tax rate was a significant independent variable with a coefficient of 0.061 and a p-value of 0.028 (see Exhibit 7).

H5: A multivariate regression with the independent variables trading volume, trailing 12-month revenues, return on capital, effective tax rate, and insider holdings did not yield any strong statistical relationships. However, return on capital is a weakly significant variable with a coefficient of 0.032 and a p-value of 0.112. This variable is positively correlated with cumulative stock returns (see Exhibits 8 and 9).

Figure 8: Multivariate Regression Results

Predictor	Coef	P
Trading Volume	0.00000000	0.170
Trailing 12-mth Revenues	0.00000005	0.207
ROC	0.03163	0.112
Eff Tax Rate	0.0201	0.536
Insider Holdings	-0.00317	0.841

VIII. ANALYSIS

Why do firms continue to invest in green initiatives if the market does not decidedly value these activities? It is unlikely that companies pursue environmental investment for purely altruistic reasons. Rather, firms may be overestimating the advantages of greening, such as waste reduction and reputation enhancement. Companies may also be investing in green activities to avoid the financial fall out that could occur from environmental liabilities or crises. The cost associated with maintaining environmental infrastructure may be less than the costs associated with responding to an environmental crisis. In fact, previous research has indicated that environmental crises decrease firm valuation by an average \$390 million, or \$0.70 per share (Klassen and McLaughlin, 1996). Subsequent studies can test this hypothesis by evaluating the degree of cumulative abnormal returns associated with announcements of green investment in addition to those associated with incidents of environmental crises.

The relationship between environmental and firm performance may appear weak because the market is judging press releases on an individual basis. Put simply, the market may respond to a press release positively or negatively, based on the financial implications of each announcement. This hypothesis is corroborated by the fact that abnormal returns vary according to the type of announcement made. Active

announcements do not exhibit a significant cumulative abnormal return, while passive investments do. This could indicate that the market evaluates active press releases based on the NPV of the particular project being announced. Since passive releases tend to announce general green behavior rather than specific green projects, the market is unable to evaluate the financial implications of these activities. It views nonspecific environmental investment in a negative light. Additionally, the insignificance of firm-specific factors in the relationship between environmental and firm performance, indicates that the market is more concerned with the content of the actual announcement than firm-level attributes. This analysis suggests that companies should dedicate their environmental budget to concrete, NPV positive projects rather than broad, overarching environmental behavior.

Differing market perceptions regarding environmental investment across industries farther complicate the relationship between environmental and firm performance. Investments in environmental initiatives by firms operating in non-customer facing industries exhibit negative cumulative abnormal returns, while investments by firms operating in customer facing industries do not. These results confirm that environmental investment can enhance a firm's reputation in the eyes of its customers, a factor that is especially meaningful in customer-facing industries. Consumers in business-to-customer relationships are more likely to be altruistically motivated to reduce their carbon footprint than consumers in business-to-business relationships. Reputation benefits can lead to a competitive advantage and, ultimately, improved financial performance (Covin and Miles, 2000). Going forward, it would be interesting to research a potential relationship between the income level of end-consumers and cumulative abnormal returns. Firms that

cater to affluent customers may be able to easily pass on the higher costs associated with green activity in the form of higher prices. If this is true, these companies are less likely to experience negative abnormal returns.

There is a significant positive relationship between a firm's effective tax rate and its cumulative stock return. This signals that higher tax rates are associated with higher cumulative returns. The average effective tax rate of non-customer facing firms is 29.0%, compared with 26.9% for customer-facing firms. These differing tax rates could also help explain variation in cumulative abnormal return across industries. A higher tax rate could induce non-customer facing firms to invest in poor environmental projects, purely for tax subsidization. Since tax credits are an important consideration in environmental investing, subsequent research could investigate whether market attitudes towards environmental investment have changed along with changes in the tax code. As we stand today, environmental tax credits are not large enough to make the majority of green investment economically attractive. However, it may be possible to adjust the tax code to encourage more environmental spend, while simultaneously producing more NPV positive investments.

Additionally, there was no discernible pattern to the degree of abnormal returns over time, a fact that indicates market perceptions towards environmental investment have not changed significantly from 2006 – 2011. Furthermore, the level of environmental coverage in the press has not played a large role in how the market judges environmental activity. Subsequent research could evaluate press releases over a broader time period to determine if changes in market perceptions occur more slowly. A broader time period may also convey a more meaningful relationship between changes in environmental press

coverage and environmental spend. It would be interesting to segment this broader data set by type of press release, by industry, and by year to determine if market perceptions have changed on a more granular level.

IX. SUMMARY

This paper focuses on the relationship between corporate environmental performance, as measured by press releases announcing environmental activity, and firm performance, as measured by abnormal stock returns. This paper concludes that there is not a strong statistical relationship between environmental and firm performance. Furthermore, it does not appear that market attitudes towards green investment have changed over time or that firm-specific variables influence abnormal returns. Although there is not a strong statistical relationship between all of the press releases studied and abnormal stock returns, there are statistically significant relationships in subsets of the data. In particular, passive press releases and releases for firms in non-customer facing industries exhibit negative cumulative abnormal returns. Additionally, effective tax rate is a statistically significant independent variable positively correlated with cumulative stock returns.

This paper suggests that the weak relationship between firm and environmental performance is partially due to variance in market reactions across press releases and industries. It appears that the market reacts to active press releases, those announcing identifiable investments, based on the financial merit of those individual projects. However, passive press releases, which cannot be judged according to this same metric, are viewed in a negative light. The market also judges press releases differently based on the type of industry a firm operates in. Firms in customer facing industries are less likely to experience negative abnormal returns because their reputation is enhanced by

investments in environmental initiatives. Non-customer facing industries do not reap this same benefit. Their announcements are accompanied by negative cumulative abnormal returns.

This paper also suggests areas for further research. Subsequent studies could utilize a larger data set that includes both environmentally positive and negative announcements. A broader data set could also be used to evaluate press releases over a longer time period. Lastly, future research could attempt to identify relationships between cumulative abnormal returns and consumer income levels or tax code changes.

APPENDIX

Exhibit 1: Regression of All Press Releases

The regression equation is:

$$\text{Cumulative Net Stock Return} = -0.00310 + 1.06 \text{ Cumulative Net Market Return}$$

Predictor	Coef	SE Coef	T	P
Constant	-0.003103	0.002156	-1.44	0.151
Cum. Mrkt. Rtn.	1.06244	0.06295	16.88	0.000

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.82030	0.82030	284.83	0.000
Residual Error	618	1.77980	0.00288		
Total	619	2.60010			

Exhibit 2: Regressions of Press Releases Segmented by Year

Year	Coef	P
2006	-0.000818	0.862
2007	0.007163	0.138
2008	-0.013185	0.105
2009	0.00222	0.725
2010	-0.003783	0.222
2011	-0.006524	0.149
<hr/>		
2006 - 2008	-0.002404	0.499
2009 - 2011	-0.003226	0.239

2006 Data

The regression equation is:

$$\text{Cumulative Net Stock Return} = -0.00082 + 0.811 \text{ Cumulative Net Market Return}$$

Predictor	Coef	SE Coef	T	P
Constant	-0.000818	0.004682	-0.17	0.862
Cum. Mrkt. Rtn.	0.8112	0.3777	2.15	0.036

$$S = 0.0339270 \quad R\text{-Sq} = 7.3\% \quad R\text{-Sq (adj)} = 5.7\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.005310	0.005310	4.61	0.036
Residual Error	59	0.067911	0.001151		
Total	60	0.073222			

2007 Data

The regression equation is:

$$\text{Cumulative Net Stock Return} = 0.00716 + 1.60 \text{ Cumulative Net Market Return}$$

Predictor	Coef	SE Coef	T	P
Constant	0.007163	0.004771	1.50	0.138
Cum. Mrkt. Rtn.	1.6047	0.2378	6.75	0.000

$$S = 0.0407402 \quad R\text{-Sq} = 39.1\% \quad R\text{-Sq (adj)} = 38.2\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.075602	0.075602	45.55	0.000
Residual Error	71	0.117843	0.001660		
Total	72	0.193445			

2008 Data

The regression equation is:

$$\text{Cumulative Net Stock Return} = -0.0132 + 1.02 \text{ Cumulative Net Market Return}$$

Predictor	Coef	SE Coef	T	P
Constant	-0.013185	0.008032	-1.64	0.105
Cum. Mrkt. Rtn.	1.0228	0.1330	7.69	0.000

$$S = 0.0666879 \quad R\text{-Sq} = 44.1\% \quad R\text{-Sq (adj)} = 43.4\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.26310	0.26310	59.16	0.000
Residual Error	75	0.33355	0.00445		
Total	76	0.59664			

2009 Data

The regression equation is:

$$\text{Cumulative Net Stock Return} = 0.00222 + 0.844 \text{ Cumulative Net Market Return}$$

Predictor	Coef	SE Coef	T	P
Constant	0.002220	0.006289	0.35	0.725
Cum. Mrkt. Rtn.	0.8445	0.1791	4.71	0.000

$$S = 0.0697822 \quad R\text{-Sq} = 14.6\% \quad R\text{-Sq (adj)} = 13.9\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.10821	0.10821	22.22	0.000
Residual Error	130	0.63304	0.00487		
Total	131	0.74126			

2010 Data

The regression equation is:

$$\text{Cumulative Net Stock Return} = -0.00378 + 1.28 \text{ Cumulative Net Market Return}$$

Predictor	Coef	SE Coef	T	P
Constant	-0.003783	0.003082	-1.23	0.222
Cum. Mrkt. Rtn.	1.2837	0.1247	10.29	0.000

$$S = 0.0345179 \quad R\text{-Sq} = 46.1\% \quad R\text{-Sq (adj)} = 45.6\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.12623	0.12623	105.95	0.000
Residual Error	124	0.14774	0.00119		
Total	125	0.27398			

2011 Data

The regression equation is:

$$\text{Cumulative Net Stock Return} = -0.00652 + 1.02 \text{ Cumulative Net Market Return}$$

Predictor	Coef	SE Coef	T	P
Constant	-0.006524	0.004500	-1.45	0.149
Cum. Mrkt. Rtn.	1.0187	0.1365	7.46	0.000

$$S = 0.0546429 \quad R\text{-Sq} = 27.4\% \quad R\text{-Sq (adj)} = 26.9\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.16636	0.16636	55.72	0.000
Residual Error	148	0.44191	0.00299		
Total	149	0.60827			

2006 - 2008 Data

The regression equation is:

$$\text{Cumulative Net Stock Return} = -0.00240 + 1.12 \text{ Cumulative Net Market Return}$$

Predictor	Coef	SE Coef	T	P
Constant	-0.002404	0.003548	-0.68	0.499
Cum. Mrkt. Rtn.	1.12067	0.09114	12.30	0.000

$$S = 0.0509068 \quad R\text{-Sq} = 42.0\% \quad R\text{-Sq (adj)} = 41.7\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.39184	0.39184	151.2	0.000
Residual Error	209	0.54162	0.00259		
Total	210	0.93347			

2009 - 2011 Data

The regression equation is:

$$\text{Cumulative Net Stock Return} = -0.00323 + 1.02 \text{ Cumulative Net Market Return}$$

Predictor	Coef	SE Coef	T	P
Constant	-0.003226	0.002737	-1.18	0.239
Cum. Mrkt. Rtn.	1.02024	0.08711	11.71	0.000

$$S = 0.0551817 \quad R\text{-Sq} = 25.3\% \quad R\text{-Sq}(\text{adj}) = 25.1\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.4177	0.4177	137.18	0.000
Residual Error	406	1.23628	0.00305		
Total	407	1.65398			

Exhibit 3: Regressions of Press Releases with the Independent Variables “Carbon Emissions” and “Global Warming”

The regression equation is:

$$\text{Cumulative Net Stock Return} = -0.00364 + 1.06 \text{ Cumulative Net Market Return} + 0.00390 \text{ Google Trend "Carbon Emissions"}$$

Predictor	Coef	SE Coef	T	P
Constant	-0.003642	0.002334	-1.56	0.119
Cum. Mrkt. Rtn.	1.06202	0.06504	16.33	0.000
"Carbon Emissions"	0.003898	0.007505	0.52	0.604

$$S = 0.0548832 \quad R\text{-Sq} = 31.8\% \quad R\text{-Sq}(\text{adj}) = 31.6\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	0.80759	0.40379	134.05	0.000
Residual Error	574	1.72898	0.00301		
Total	576	2.53657			

Source	DF	Seq SS
Cum. Mrkt. Rtn.	1	0.80677
"Carbon Emissions"	1	0.00081

The regression equation is:

$$\text{Cumulative Net Stock Return} = -0.00283 + 1.06 \text{ Cumulative Net Market Return} - 0.0103 \text{ Google Trend "Global Warming"}$$

Predictor	Coef	SE Coef	T	P
Constant	-0.002825	0.002191	-1.29	0.198
Cum. Mrkt. Rtn.	1.06477	0.06325	16.83	0.000
"Global Warming"	-0.01031	0.01293	-0.8	0.426

S = 0.0537231 R-Sq = 31.5% R-Sq(adj) = 31.3%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	0.81818	0.40909	141.74	0.000
Residual Error	616	1.77788	0.00289		
Total	618	2.59606			

Source	DF	Seq SS
Cum. Mrkt. Rtn.	1	0.81635
"Global Warming"	1	0.00183

Exhibit 4: Regressions of Press Releases Segmented by Type of Press Release

Active

The regression equation is

$$\text{Cumulative Net Stock Return} = 0.00189 + 1.07 \text{ Cumulative Net Market Return}$$

Predictor	Coef	SE Coef	T	P
Constant	0.001894	0.002748	0.69	0.491
Cum. Mrkt. Rtn.	1.07479	0.08589	12.51	0.000

S = 0.0480272 R-Sq = 34.0% R-Sq(adj) = 33.8%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.3612	0.3612	156.59	0.000
Residual Error	304	0.70121	0.00231		
Total	305	1.06241			

Passive

The regression equation is

$$\text{Cumulative Net Stock Return} = -0.00811 + 1.04 \text{ Cumulative Net Market Return}$$

Predictor	Coef	SE Coef	T	P
Constant	-0.008111	0.003316	-2.45	0.015
Mrkt	1.03757	0.09172	11.31	0.000

S = 0.0584609 R-Sq = 29.2% R-Sq(adj) = 28.9%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.43735	0.43735	127.97	0.000
Residual Error	311	1.0629	0.00342		
Total	312	1.50025			

Exhibit 5: Industry Segmentation

Customer Facing	Count
Consumer Discretionary	154
Consumer Staples	107
Information Technology	99
Health Care	27
Financials	15
Telecommunication Services	14
Total	416
Non-Customer Facing	Count
Industrials	103
Materials	61
Utilities	31
Energy	8
Total	203

Exhibit 6: Regressions of Press Releases Segmented by Type of Industry

Non-Customer Facing

The regression equation is

$$\text{Cumulative Net Stock Return} = -0.00930 + 1.15 \text{ Cumulative Net Market Return}$$

Predictor	Coef	SE Coef	T	P
Constant	-0.009296	0.00456	-2.04	0.043
Cum. Mrkt. Rtn.	1.1542	0.1278	9.03	0.000

$$S = 0.0647175 \quad R\text{-Sq} = 28.9\% \quad R\text{-Sq}(\text{adj}) = 28.5\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.3418	0.3418	81.61	0.000
Residual Error	201	0.84186	0.00419		
Total	202	1.18366			

Customer Facing

The regression equation is:

$$\text{Cumulative Net Stock Return} = 0.00006 + 1.00 \text{ Cumulative Net Market Return}$$

Predictor	Coef	SE Coef	T	P
Constant	0.000057	0.002313	0.02	0.980
Cum. Mrkt. Rtn.	1.00319	0.06927	14.48	0.000

$$S = 0.0471772 \quad R\text{-Sq} = 33.6\% \quad R\text{-Sq}(\text{adj}) = 33.5\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.46678	0.46678	209.72	0.000
Residual Error	414	0.92143	0.00223		
Total	415	1.38821			

Exhibit 7: Regressions of Press Releases with the Independent Variable Effective Tax Rate

The regression equation is

$$\text{Cumulative Net Stock Return} = -0.0186 + 1.03 \text{ Cumulative Net Market Return} + 0.0608 \text{ Eff. Tax Rate}$$

Predictor	Coef	SE Coef	T	P
Constant	-0.018577	0.008228	-2.26	0.025
Cum. Mrkt. Rtn.	1.02918	0.08364	12.3	0.000
Eff Tax Rate	0.0608	0.02761	2.2	0.028

$$S = 0.0582676 \quad R\text{-Sq} = 30.9\% \quad R\text{-Sq(ajd)} = 30.5\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	0.52212	0.26106	76.89	0.000
Residual Error	344	1.16792	0.0034		
Total	346	1.69004			

Source	DF	Seq SS
Cum. Mrkt. Rtn.	1	0.50566
Eff Tax Rate	1	0.01646

Exhibit 8: Multivariate Correlation Matrix

Pearson Correlation <i>P-Value</i>	Trading Volume	Trailing 12- mth Revenues	ROC	Eff Tax Rate
Trailing 12-mth Revenues	0.287 <i>0.000</i>			
ROC	0.090 <i>0.104</i>	0.018 <i>0.747</i>		
Eff Tax Rate	-0.098 <i>0.067</i>	0.171 <i>0.002</i>	0.071 <i>0.202</i>	
Insider Holdings	-0.096 <i>0.106</i>	0.228 <i>0.000</i>	0.007 <i>0.908</i>	0.131 <i>0.026</i>

Exhibit 9: Regression of Press Releases with the Independent Variables Trading Volume, Trailing 12-month Revenues, Return on Capital, Effective Tax Rate, and Insider Holdings

The regression equation is

$$\text{Cumulative Net Stock Return} = -0.0109 + 1.12 \text{ Cumulative Net Market Return} - 0.000000 \text{ Trading Volume} + 0.000000 \text{ Trailing 12-mth Revenues} + 0.0317 \text{ ROC} + 0.0202 \text{ Eff Tax Rate} - 0.0033 \text{ Insider Holdings}$$

Predictor	Coef	SE Coef	T	P
Constant	-0.01088	0.01083	-1.00	0.316
Cum. Mrkt. Rtn.	1.12022	0.09565	11.71	0.000
Trading Volume	-0.00000000	0.00000000	-1.39	0.166
Trailing 12-mth Revenues	0.00000005	0.00000004	1.27	0.206
ROC	0.03168	0.01979	1.60	0.111
Eff Tax Rate	0.02021	0.03238	0.62	0.533
Insider Holdings	-0.00333	0.01578	-0.21	0.833

S = 0.0600517 R-Sq = 36.5% R-Sq(adj) = 35.0%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	6	0.527497	0.087916	24.38	0.000
Residual Error	255	0.919584	0.003606		
Total	261	1.447081			

Source	DF	Seq SS
Cum. Mrkt. Rtn.	1	0.509625
Trading Volume	1	0.001586
Trailing 12-mth Revenues	1	0.005244
ROC	1	0.009558
Eff Tax Rate	1	0.001324
Insider Holdings	1	0.00016

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**Secondary Markets for Private Company Shares:
Marketplace Overview and Predictive Capability**

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I. INTRODUCTION

The marketplace for private company shares has evolved rapidly over the last few years in response to changing market dynamics and increasing interest in the next generation of large Internet-based companies. This paper provides an overview of the evolution of the private company secondary marketplace in the United States, its current players, and the risks and benefits to those involved. The paper then discusses several companies that have transitioned from secondary market transactions to initial public offerings (IPOs). Finally, this paper evaluates the ability of secondary market data to predict share price changes post IPO.

II. EVOLUTION OF THE MARKETPLACE

A wave of companies is vying for a role in the secondary marketplace for private company shares. Until recently, trading platforms were limited to institutional buyers and most transactions were conducted largely on an ad-hoc basis.¹ Secondary interests in private company shares could be acquired through investment funds or on an individual basis.² Shares could be purchased directly from founders, employees, angel investors or general partners of older vintage venture capital funds seeking liquidity.³ Alternatively, shares could be acquired indirectly, for example, in the form of limited partnership interests.⁴

¹ Jose Miguel Mendoza and Erik P. M. Vermeulen, *The 'New' Venture Capital Cycle (Part I): The Importance of Private Secondary Market Liquidity*, Lex Research Topics in Corporate Law & Economics Working Paper No. 1/2011 (May 3, 2011). Available at: <http://ssrn.com/abstract=1829835>.

² *Id.*

³ Hans Swildens, *Venture Capital Secondary Funds – The Third Exit Option: A smart way to improve fund performance and unlock hidden value*, Industry Ventures LLC White Paper (May 2008). Available at: http://www.industryventures.com/pdf/Venture_Capital_Secondaries_White_Paper.pdf.

⁴ *Id.*

In 1990, Nasdaq launched PORTAL (Private Offerings, Resales, and Trading through Automated Linkages) as a private institutional marketplace for 144A securities.⁵ 144A is a safe harbor that provides qualified institutional buyers with an exemption from the registration requirements of Section 5 of the Securities Act.⁶ A web-based version of PORTAL was approved by the SEC on July 31, 2007 and began operating on August 15, 2007.^{7,8} At roughly the same time, several investment banks launched their own trading systems. Goldman Sachs launched its GStrUE (Tradable Unregistered Equity) system in May, 2007.^{9,10} A group of five Wall Street firms (Citigroup, Bank of New York Mellon, Lehman Brothers, Merrill Lynch, and Morgan Stanley) formed OPUS-5 (Open Platform for Unregistered Securities) in August 2007 and were later joined by Bank of America, Credit Suisse, and UBS.¹¹ Several other firms, including JPMorgan Chase and Bear Sterns, launched their own platforms.¹²

In November 2007, Nasdaq and twelve Wall Street firms announced the Portal Alliance.^{13,14} The alliance formed to merge several different 144A platforms (including

⁵ *Self-Regulatory Organizations; The NASDAQ Stock Market LLC; Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Eliminate Rules Related to Nasdaq's PORTAL Market*, Securities and Exchange Commission (Release No. 34-60991; File No. SR-NASDAQ-2009-092) (November 12, 2009). Available at: <http://www.sec.gov/rules/sro/nasdaq/2009/34-60991.pdf>.

⁶ 17 C.F.R. § 230.144A (2012).

⁷ *Order Granting The NASDAQ Stock Market LLC's Application for an Exemption Pursuant to Section 36 of the Securities Exchange Act of 1934*, Securities and Exchange Commission (Release No. 34-56176) (July 31, 2007). Available at: <http://www.sec.gov/rules/exorders/2007/34-56176.pdf>.

⁸ *NASDAQ's Electronic Trading Platform for the 144A Private Placement Market is Approved by the SEC: The PORTAL Market Trading System Will Begin Operating On August 15*, The Nasdaq Stock Market, Inc. Press Release (August 1, 2007). Available at: <http://ir.nasdaqomx.com/releasedetail.cfm?ReleaseID=257543>.

⁹ Arleen Jacobius, *Slow start, great hope for Nasdaq private exchange: Pensions & Investments*, SecondMarket (January 14, 2010). Available at: <https://www.secondmarket.com/discover/news/slow-start-great-hope-for-nasdaq-private-exchange>.

¹⁰ Gregory Zuckerman, *A Hot Idea Falls Short at Goldman*, WSJ.com (April 7, 2011). Available at: <http://online.wsj.com/article/SB10001424052748704587004576245101094450490.html>.

¹¹ Elena Schwieger, Comment, *Redefining the Private Placement Market After Sarbanes-Oxley: Nasdaq's Portal and Rule 144A*, 57 Cath. U. L. Rev. 885 (2008).

¹² *Id.*

¹³ *About the PORTAL Alliance*, Available at: http://www.portalalliancemarket.com/about_pa_content.aspx.

¹⁴ Anupreeta Das, Nasdaq, *Wall St Firms Join Forces for 144a Market*, Reuters (November 12, 2007). Available at: <http://www.reuters.com/article/2007/11/12/sppage012-n12453209-oisbn-idUSN1245320920071112>. The initial

GsTRUE and OPUS-5).¹⁵ The financial difficulties of several of the firms involved, including Lehman Brothers and Bear Sterns, delayed the launch until September 2009 when nine banks agreed to list 144A or private company transactions.¹⁶

Another marketplace, NYPPEX, has been active in the secondary private markets since 1998.¹⁷ According to the firm, they are “one of the world's leading private equity secondary intermediaries for single interest transactions having a minimum size of \$100,000 up to \$10 million [and]... help founders, key employees and individual investors achieve superior transaction speed and price execution, with minimal market impact.”¹⁸ The investment bank Friedman Billings Ramsey also entered the 144A transaction space in 1997 and, according to the firm, “has since been the dominant firm in the Rule 144A equity market. In the last ten years, the firm has completed nearly 10 times as many 144A transactions and raised nearly 10 times as much capital via these transactions as any other investment bank.”¹⁹

While the 144A market has been successful in supporting larger transactions, the focus on institutional investors resulted in very limited acceptance for smaller offerings, including those of venture-backed companies.^{20,21,22} Grant Thornton hypothesizes that the absence of

twelve firms were: Bank of America, Bear Stearns, Citigroup, Credit Suisse, Deutsche Bank, Goldman Sachs, JPMorgan, Lehman Brothers, Merrill Lynch, Morgan Stanley, UBS, and Wachovia.

¹⁵ *Id.*

¹⁶ Arleen Jacobius, *Slow start, great hope for Nasdaq private exchange: Pensions & Investments*, SecondMarket (January 14, 2010) (The nine firms were: Bank of America, Merrill Lynch, Credit Suisse Group, Deutsche Bank AG, Citigroup Inc., Goldman Sachs Group Inc., JP Morgan Chase & Co., Morgan Stanley, UBS AG, and Wells Fargo Securities LLC). Available at: <https://www.secondmarket.com/discover/news/slow-start-great-hope-for-nasdaq-private-exchange>.

¹⁷ *Our Company*, NYPPEX Private Markets, <http://nyppex.com/company.php> (2011).

¹⁸ *Brokerage*, NYPPEX Private Markets, <http://nyppex.com> (2011).

¹⁹ *Our History*, FBR & Co, <http://www.fbr.com/Company/FBR/History.aspx>.

²⁰ Arleen Jacobius, *Slow start, great hope for Nasdaq private exchange: Pensions & Investments*, SecondMarket (January 14, 2010). Available at: <https://www.secondmarket.com/discover/news/slow-start-great-hope-for-nasdaq-private-exchange>.

²¹ Gregory Zuckerman, *A Hot Idea Falls Short at Goldman*, WSJ.com (April 7, 2011). Available at: <http://online.wsj.com/article/SB10001424052748704587004576245101094450490.html>.

²² Jay R. Ritter, *Equilibrium in the IPO Market* (April 25, 2011). Available at: <http://ssrn.com/abstract=1822542>.

“individual investors from the market is likely to undercut its ability to support small offerings, because large populations of small (retail) investors are what historically support liquidity and valuations in small cap stocks.”²³

III. CURRENT PLAYERS

The traditional ad-hoc methods discussed in Section I continue to be the primary mechanism for transacting in private company shares.²⁴ The ecosystem has broadened to include several additional avenues for the players involved. Secondary funds, exchange funds, secondary marketplaces, financial firm platforms, and Nasdaq-listed companies that provide indirect access to private company securities are discussed below.

a. Secondary Funds

There are several active secondary funds, including those managed by Industry Ventures, Millennium Technology Value Partners, Saints Capital, and W Capital Partners.²⁵ Industry Ventures was founded in 2000 and has secondary funds that invest in venture-backed company shares by purchasing shares directly from founders, employees, investors, and general partners or by acquiring limited partnership interests.^{26,27} Investments have included interests in Pandora,

²³ David Weild and Edward Kim, *Why are IPOs in the ICU?*, Grant Thornton White Paper. Available at: http://www.gt.com/staticfiles/GTCom/files/GT%20Thinking/IPO%20white%20paper/Why%20are%20IPOs%20in%20the%20ICU_11_19.pdf.

²⁴ Chris Kelley, *Panel – Private Company Stock Market – Friend or Foe?*, SecondMarket Capitalize 2011 Conference, San Francisco. (May 11, 2011). Video available at: <https://www.secondmarket.com/discover/capitalize>.

²⁵ Darian M. Ibrahim, *The New Exit in Venture Capital*, University of Wisconsin Legal Studies Research Paper No. 1137 (October 7, 2010). Available at: <http://ssrn.com/abstract=1688982>.

²⁶ *Focusing on Inefficiencies in Venture Capital*, Industry Ventures, <http://www.industryventures.com/home.html>.

²⁷ *Founders, Management & Early Investors*, Industry Ventures, http://www.industryventures.com/founders_early_investors.html.

Facebook, and Twitter.²⁸ In July 2011, Industry Ventures closed its sixth secondary fund (\$400 million).

Millennium Technology Value Partners develops alternative liquidity programs in partnership with venture-backed companies.^{29,30} It launched its current strategy in 2002 and closed its most recent fund (\$280 million) in April 2010.^{31,32} Investments have been made in over 300 companies including Facebook, Twitter, and Zappos.³³ Saints Capital launched in 2000 and provides liquidity for private company investors through customized transactions.³⁴ Saints Capital has invested in high-growth industries such as software, internet, healthcare and business services.³⁵ W Capital Partners was formed in 2001 and provides secondary liquidity in several categories including growth and venture capital.^{36,37} Investments include Internet, communications and infrastructure, life sciences, and software and services companies.³⁸

b. Exchange clubs

Several creative alternatives have developed to satisfy the need for liquidity in smaller secondary offerings. In December 2009 in London and October 2010 in the United States, the Founders Club was launched to allow company founders to swap part of their future income

²⁸ Sam Sutton, *Industry Ventures raises \$400m for secondaries: The San Francisco secondaries firm exceeded its sixth fund's \$300m target by attracting new LPs and re-ups*, Private Equity International (July 11, 2011). Available at: <http://www.industryventures.com/pdf/PEI62068.pdf>.

²⁹ *Overview*, Millennium Technology Value Partners, <http://mtvlp.com/overview> (2012).

³⁰ Dan Burstein, *Panel - Secondary Transaction Mechanics and Primer*, SecondMarket Capitalize 2012 Conference, New York (February 15, 2012). Video available at: <https://www.secondmarket.com/discover/event-replay-capitalize-east>.

³¹ *Millennium Technology Value Partners*, CrunchBase, <http://www.crunchbase.com/financial-organization/millennium-technology-ventures>.

³² *Millennium Technology Value Partners II, L.P. Closes on \$280 Million for New Fund*, Millennium Technology Value Partners Selected Highlights of Media Coverage, <http://www.mtvlp.com/files/news/Media%20Coverage%202010%20Press%20Release.pdf> (April 2010).

³³ *Overview*, Millennium Technology Value Partners, <http://mtvlp.com/overview> (2012).

³⁴ *Overview*, Saints VC, <http://www.saintsvc.com/about/overview> (2012).

³⁵ *Id.*

³⁶ W Capital Partners, <http://wcapgroup.com> (2011).

³⁷ *All Investments*, W Capital Partners, <http://wcapgroup.com/PortfolioCompanies/tabid/59/Default.aspx> (2011).

³⁸ *Id.*

streams for ownership in the fund and the potential for more immediate liquidity than their individual companies could provide.^{39,40} Entrex’s “TIGRcub™” structure offers a similar service that provides “Investors with monthly income, liquidity and investment returns that are not based on exit events, or exposed to the volatility of the equity capital markets—all while providing Issuers a non-dilutive capital solution with risk-adjusted pricing simulating either debt or equity structures.”⁴¹

c. Marketplaces

i. SecondMarket

SecondMarket, which initially provided a liquidity solution for restricted securities in public companies, began transacting in private company shares in 2008 and launched its private company marketplace in mid-2009.⁴² The popularity of Facebook and its early presence in the marketplace has created significant positive publicity for SecondMarket.⁴³ SecondMarket completed \$558 million in private company transactions in 2011 (a 55% increase from the previous year) and over \$1 billion since 2008.⁴⁴ Nearly 15,000 accredited investors are on the platform with over \$6 billion in indications of interest in 2011.⁴⁵

SecondMarket earns a fee of at least \$2,500 for each completed transaction. The fee is “determined on a case-by-case basis depending on many factors, including, but not limited, to

³⁹ *About The Founders Club*, The Founders Club, <http://founders-club.com/about-the-founders-club.html>.

⁴⁰ *Sell Shares for Cash*, The Founders Club, <http://founders-club.com/about-the-founders-club/sell-shares-for-cash-direct-secondaries.html>.

⁴¹ *About Us*, Entrex, http://www.entrex.net/about_us.shtml.

⁴² *Company Overview*, SecondMarket Holdings Inc., <https://www.secondmarket.com/about-us?t=fl> (2012).

⁴³ According to M. Adam Oliveri, Managing Director – Private Company Market, SecondMarket, as of February 15, 2012, Facebook continued to generate the largest volume of transactions on SecondMarket. M. Adam Oliveri, *Panel - The Secondary Market Big Picturer*, SecondMarket Capitalyze 2012 Conference, New York (February 15, 2012). Video available at: <https://www.secondmarket.com/discover/event-replay-capitalyze-east>.

⁴⁴ *SecondMarket’s 2011 Year End Private Company Report*, SecondMarket Holdings Inc. (January 19, 2012). Available at: <https://www.secondmarket.com/discover/reports/secondmarkets-2011-year-end-private-company-report>.

⁴⁵ *Id.*

the asset type, value of the asset, and complexity of the transaction.”^{46,47} The minimum transaction size is \$100,000, which SecondMarket feels is necessary to justify the fixed costs involved.⁴⁸ In addition to SecondMarket’s commission, transaction costs include an opinion letter of the seller’s counsel that the private placement exemption from registration applies (\$2,500 for small transactions, more for larger) and potentially transfer fees required by the company to cover the administrative costs of transferring shares from seller to buyer.⁴⁹

Initially, SecondMarket did not require the consent of the issuer, but their model has evolved. Now SecondMarket designs “customized liquidity program[s]” for the company and considers the company as their customer.^{50,51} Companies are allowed to determine how the marketplace for their shares is structured. The companies decide who may sell to whom (e.g., only former employees to existing shareholders), the number of shares that can be sold, the transaction frequency (e.g., weekly, or, in most cases quarterly or annually), and the pricing structure (e.g., a negotiated one-off transaction vs. auction).⁵² Each company is audited and required to provide financial information to eligible buyers and sellers through a secure data room.⁵³

⁴⁶ SecondMarket Admin, *How does SecondMarket make money?*, SecondMarket Holdings Inc., <http://support.secondmarket.com/entries/351048-how-does-secondmarket-make-money> (December 06, 2010).

⁴⁷ SecondMarket Admin, *Is there a minimum transaction size for buying securities through SecondMarket?*, <http://support.secondmarket.com/entries/350710-is-there-a-minimum-transaction-size-for-buying-securities-through-secondmarket> (December 06, 2010).

⁴⁸ *Id.*

⁴⁹ *Id.*

⁵⁰ Jeremy Smith, *Presentation – A Deep Dive into Secondary Market Mechanics*, SecondMarket Capitalize 2011 Conference, San Francisco. (May 11, 2011). Video available at: <https://www.secondmarket.com/discover/capitalize>.

⁵¹ Tom Johansmeyer, *The Differences Between SecondMarket and SharesPost According to Their CEOs*, Business Insider (December 1, 2011). Available at: <http://www.businessinsider.com/the-differences-between-secondmarket-and-sharespost-according-to-their-ceos-2011-12>.

⁵² *The Future of Capital Formation: Hearing Before the House Committee on Government and Oversight Reform*, 112th Congress (May 10, 2011) (statement of Barry Silbert, CEO, SecondMarket). Available at: http://oversight.house.gov/images/stories/Testimony/5-10-11_Barry_Silbert_Capital_Formation_Testimony.pdf.

⁵³ *The Future of Capital Formation: Hearing Before the House Committee on Government and Oversight Reform*, 112th Congress (May 10, 2011) (statement of Mary Schapiro, Chairman, Securities and Exchange Commission).

Consumer web and social media transactions dominate on SecondMarket, making up 61.4% of transactions in 2011.⁵⁴ Figure 1 provides a detailed breakdown of the 2011 transactions by industry. A typical company on the platform has at least \$20 million in revenue and a market capitalization of \$100 million, is four or more years old, has received at least Series B funding, and has more than fifty shareholders.⁵⁵

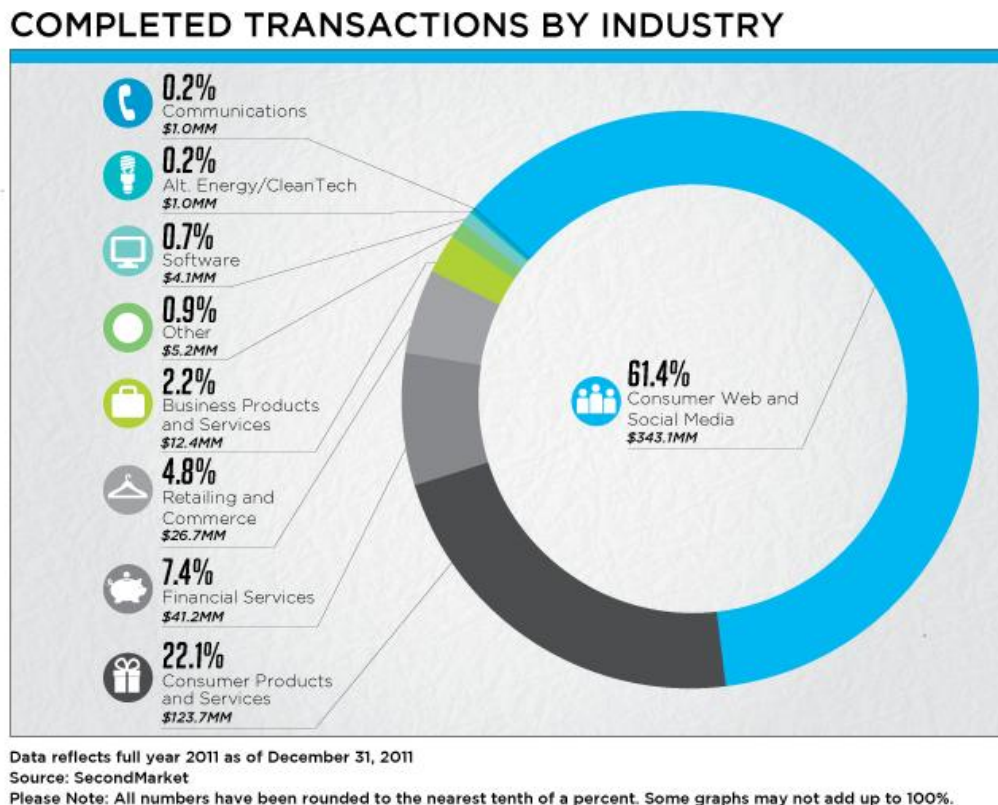


Figure 1⁵⁶

Available at: http://oversight.house.gov/images/stories/Testimony/5-10-11_Schapiro_Capital_Formation_Testimony.pdf

⁵⁴ *SecondMarket's 2011 Year End Private Company Report*, SecondMarket Holdings Inc. (January 19, 2012).

Available at: <https://www.secondmarket.com/discover/reports/secondmarkets-2011-year-end-private-company-report>.

⁵⁵ Jamie Hutchinson, *Panel - Secondary Transaction Mechanics and Primer*, SecondMarket Capitalize 2012 Conference, New York (February 15, 2012). Video available at: <https://www.secondmarket.com/discover/event-replay-capitalize-east>.

⁵⁶ *SecondMarket's 2011 Year End Private Company Report*, SecondMarket Holdings Inc. (January 19, 2012).

Available at: <https://www.secondmarket.com/discover/reports/secondmarkets-2011-year-end-private-company-report>.

Institutional buyers were parties in 72.8% of the \$558 million in transactions. Figure 2 provides a more detailed breakdown on the type of institutional buyers on SecondMarket.

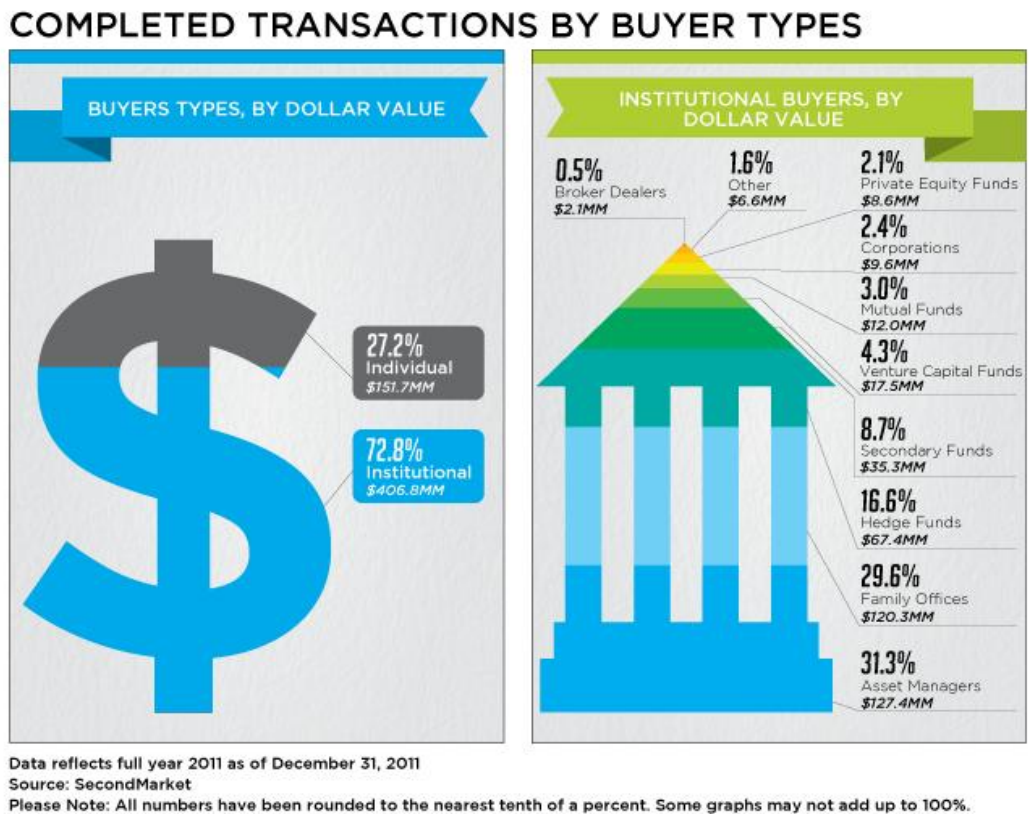


Figure 2⁵⁷

A large majority of sellers in 2011 were ex-employees (79.3% by dollar value). Employees (11.1%), investors (3.7%), founders (0.4%), and others (5.5%) make up the remainder.⁵⁸

In March 2011, SecondMarket launched a “watching” feature to provide investors with a way of tracking companies of interest.⁵⁹ As of January 26, 2012, there were 18,716 companies available for watching on SecondMarket; however, fewer than a third (6,011) had one or more watchers.⁶⁰ As illustrated in Figure 3, the majority of companies have relatively few watchers.

⁵⁷ *Id.*

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ *Search Companies*, SecondMarket Holdings Inc., <https://www.secondmarket.com/private-company-search>.

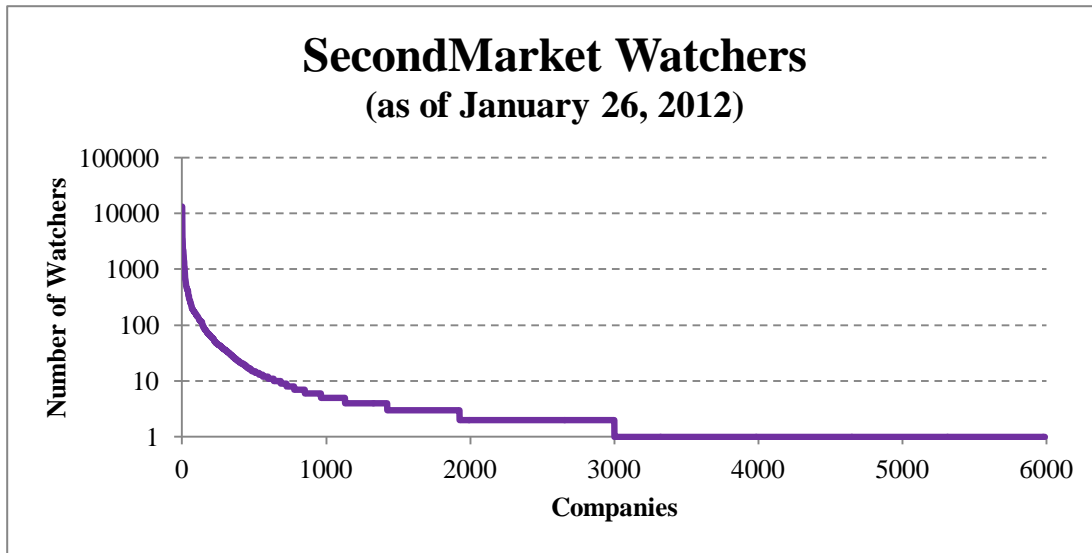


Figure 3⁶¹

The top ten companies watched as of January 26, 2012 were Facebook (13,296 watchers), Twitter (7,254), Foursquare (3,722), Dropbox (3,534), Yelp (2,929), Gilt Group (2,310), Hulu (2,258), Square (2,229), LivingSocial (2,178), and Craigslist (1,962).⁶²

ii. SharesPost

SharesPost was founded in early 2009 and, per the company, connects over 86,000 institutional and individual investors with over \$1 billion worth of private company shares.⁶³

SharesPost is focused exclusively on private company transactions (SecondMarket, on the other hand, handles several categories of illiquid assets). As of November 2011, SharesPost was handling four trades per day and had completed transactions for forty different companies in 2011.⁶⁴

⁶¹ Data from *Search Companies*, SecondMarket Holdings Inc., <https://www.secondmarket.com/private-company-search>.

⁶² *Id.*

⁶³ *About Us*, SharesPost Inc., <https://www.sharespost.com/pages/about>.

⁶⁴ *Interview - Weir Sees 'Explosive' Growth in Secondary Markets*, The Washington Post (November 9, 2011). Video available at: http://www.washingtonpost.com/business/weir-sees-explosive-growth-in-secondary-markets/2011/11/09/gIQAjDnt6M_video.html.

SharesPost uses FINRA-registered specialists to assist in consummating transactions. The specialists charge a 3% commission on the transaction value (minimum of \$5,000).⁶⁵ U.S. Bank is available as escrow agent and charges \$1,500 to both buyer and seller for each transaction.⁶⁶ The minimum sales price on SharesPost is \$25,000.⁶⁷ Companies traded on SharesPost are usually valued at \$100 million or more, have at least \$10 million in revenue, and were founded at least 5 years ago.⁶⁸

Unlike SecondMarket, SharesPost does not require the involvement of the company whose shares are transacted. Companies that choose to be involved are able to control who buys (e.g. only institutional buyers or certain individuals) and who sells, when transactions occur, and under what terms.⁶⁹

SharesPost does not provide reports summarizing the types of companies transacted on its platform. However, based on the data that is provided, SharesPost hosts a large number of cleantech/energy transactions. On January 26, 2012, there were 23 companies with buy or sell offers available on SharesPost. SharesPost categorizes the companies as cleantech/energy (5 listed), consumer (3), software (3), enterprise (2), retail (2), web (2), financial services (2), social (2), advertising & marketing (1), biotech (1), healthcare (0), media & online content (0), and telecom/hardware (0). Facebook is the most commonly traded company on SharesPost. There have been over 200 Facebook transactions since August 20, 2009.⁷⁰

In addition to providing transaction data via its website and Bloomberg terminals, SharesPost has made efforts to provide additional information and transparency through its

⁶⁵ *Sellers FAQs*, SharesPost Inc., <https://www.sharespost.com/pages/faqs>.

⁶⁶ *Id.*

⁶⁷ *Id.*

⁶⁸ *Id.*

⁶⁹ *Sharespost Private Investor Portals*, SharesPost Inc., <https://www.sharespost.com/pages/company-benefits> (2012).

⁷⁰ Data was gathered from SharesPost.com and Bloomberg.

“SharesPost Venture-Backed Index” and research reports. The index aggregates transaction data, current posts on the marketplace, and research-based valuation estimates for seven companies.⁷¹ The index provides some basis for determining trends in the secondary marketplace for private company shares. SharesPost also makes available a large number of research reports, which typically include an overview of the company’s products, markets, and competitors, financial information, forecasts, and valuations.⁷² These reports are designed to assist buyers and sellers with their investment decisions (with disclaimers). However, questions have been raised regarding the independence of these reports.⁷³ Significant potential issues remain with the level of information provided on all the secondary markets.

iii. Xpert Financial

Xpert Financial was founded in early 2009 with the support of well-known venture capitalist Tim Draper, who is chairman of the company’s board.^{74,75} Xpert Financial has not disclosed information on its transactions to the extent of SharesPost or SecondMarket and more tightly controls login access to its site (which is limited to shareholders, companies, accredited investors, and qualified institutional buyers).^{76,77}

Xpert Financial uses a registered broker-dealer subsidiary, Xpert Securities, to provide an online trading platform called Xpert ATS for transacting in private company shares.⁷⁸ The platform supports both primary offerings and secondary trading. Shares are sold through either a

⁷¹ As of March 13, 2012, the index companies are Bloom Energy, Eharmony, Facebook, Gilt Groupe, Linden Lab, Serious Energy, and Twitter.

⁷² *Research*, SharesPost Inc., <https://www.sharespost.com/research>.

⁷³ Usha Rodrigues, *Who’s Buying on SharesPost? Who’s Selling? Reply Hazy, Try Again*, The Conglomerate (January 6, 2012). Available at: <http://www.theconglomerate.org/2012/01/whos-buying-on-sharespost-we-dont-know.html>.

⁷⁴ *Xpert Financial*, CrunchBase, <http://www.crunchbase.com/company/xpert-financial>.

⁷⁵ *Leadership*, Xpert Financial, <https://www.xpertfinancial.com/about/leadership.html>.

⁷⁶ *Register for an Account*, Xpert Securities Inc., <https://www.xpertsecurities.com/apply>.

⁷⁷ Matt Bowman, *Interview - Tim Draper unveils the XChange Marketplace*, Vator News (June 1, 2009). Video available at: <http://vator.tv/news/2009-05-31-the-rise-of-the-secondary-markets>.

⁷⁸ *About Us*, Xpert Financial Inc., https://www.xpertfinancial.com/about/about_us.html.

fixed-price offering or a modified Dutch auction.⁷⁹ Xpert Financial indicates that by using its “auto-execution technology”, transactions can settle and clear in days rather than the weeks or months previously necessary.⁸⁰ Companies are given control over the market for their shares, including who can sell and who can buy.⁸¹ However, according to a February 3, 2012 Wall Street Journal article, Xpert Financial may have shifted its focus away from secondary transactions and towards primary.⁸² A subsequent Xpert Financial press release appears to have confirmed this shift; all of the examples of companies using its platform focused on primary capital raises (with exception of one that included a purchase from an existing rights holder in conjunction with a primary raise).⁸³

d. Recent Entrants

In 2011, several firms announced their plans to provide platforms for trading private company shares. These efforts are likely in response to the success demonstrated by SecondMarket and SharesPost. However, unlike SecondMarket and SharesPost, most of these new entrants are focused solely on institutional investors (with the exception of Wedbush Securities and Gate Technologies, which also service accredited individuals).

In February 2011, Gate Technologies announced the purchase of InfoExchange as a means for providing improved investment research to customers and an aid in its competition

⁷⁹ Xpert Private Offerings, Xpert Financial, https://www.xpertfinancial.com/products/products_xpo.html.

⁸⁰ *Private Market Share Transactions Radically Streamlined*, Press Release, Xpert Financial Inc. (April 29, 2011). Available at: https://www.xpertfinancial.com/about/press_release/auto_execute.html.

⁸¹ *Xpert Financial Announces Fully-Electronic Alternative Trading System for Private Company Securities*, Press Release, Xpert Financial Inc. (January 3, 2011). Available at: https://www.xpertfinancial.com/about/press_release/first_sec_registered_ats.html.

⁸² Rolfe Winkler, *Facebook's Painful Secondary Impact*, WSJ Online (February 3, 2012). Available at: <http://online.wsj.com/article/SB10001424052970204662204577199220078140972.html>.

⁸³ *Xpert Financial Sees Growing Interest In Its Secondary Trading Platform*, PEHUB citing Xpert Financial Press Release, <http://www.pehub.com/140013/xpert-financial-sees-growing-interest-in-its-secondary-trading-platform> (March 9, 2012).

with SecondMarket and Sharespost.⁸⁴ Gate Technologies hoped to centralize transactions through its electronic platform. However, a recent Wall Street Journal article indicates the company has had difficulty gaining traction.^{85,86} Also in February, Mission Markets, a social impact investment firm, announced its first secondary offering of private company stock.⁸⁷

In October 2011, Cantor Fitzgerald, a financial services firm, announced that it was forming the Cantor Private Markets Group to offer clients the opportunity to invest in private company stock (as well as REITs and private equity and hedge fund interests).⁸⁸ Liquidnet, a global institutional trading network, also announced in October 2011 that it was entering “the fast-growing market in private-company shares trading.”⁸⁹ Liquidnet indicated that it will focus on large institutional investors seeking access to high-growth companies and will work directly with private companies to establish liquidity programs.⁹⁰ However, the executive hired to run Liquidnet’s private company program resigned after just three months raising questions about the status of their program.⁹¹

⁸⁴ Nina Mehta and Jeff Kearns, *Gate Buys InfoEx as Private-Trading Rivalry Grows*, Bloomberg (February 7, 2011). Available at: <http://www.bloomberg.com/news/2011-02-07/gate-buys-infoex-as-private-trading-rivalry-grows-correct-.html>.

⁸⁵ *Id.*

⁸⁶ Rolfe Winkler, *Facebook's Painful Secondary Impact*, WSJ Online (February 3, 2012). Available at: <http://online.wsj.com/article/SB10001424052970204662204577199220078140972.html>.

⁸⁷ *Mission Markets First to Facilitate Secondary Liquidity for Impact Investing Markets*, Business Wire (February 15, 2011). Available at: <http://www.businesswire.com/news/home/20110215005230/en/Mission-Markets-Facilitate-Secondary-Liquidity-Impact-Investing>.

⁸⁸ *Cantor Fitzgerald & Co. Announces the Expansion of Its Private Securities Business with the Formation of Cantor Private Markets*, Press Release, Cantor Fitzgerald & Co. (October 6, 2011). Available at: http://www.cantor.com/press_releases/Cantor_Fitzgerald__Co_Announces_the_Expansion_of_Its_Private_Securities_Business_with_the_Formation_of_Cantor_Private_Markets_.html.

⁸⁹ *Liquidnet Launches Global Institutional Platform for Fast Growing Private-Company Shares Trading*, Press Release, Liquidnet Holdings Inc. (October 17, 2011). Available at: <http://liquidnet.com/docs/liquidnetBuzz/pressReleases/2011/Kerner%20Announcement%20FINAL.pdf>.

⁹⁰ *Id.*

⁹¹ Ari Levy and Chris Dolmetsch, *Lou Kerner Departs Liquidnet After Three Months on the Job*, BusinessWeek (January 24, 2012). Available at: <http://www.businessweek.com/news/2012-01-24/lou-kerner-departs-liquidnet-after-three-months-on-the-job.html>.

On December 1, 2011, Wedbush Securities, a full-service investment firm, announced the expansion of its Private Shares Group, which focuses on the social media space.⁹² Wedbush creates tailored programs that allow existing and former employees, venture capitalists, private equity, and other investors to sell their shares.⁹³ Services are offered to both institutional and accredited investors.⁹⁴ Also in early December, the brokerage firm GFI Group announced that it launched a private shares group and will focus on the institutional side of the market.⁹⁵ Later in December, Knight Capital Group, a global financial services firm, announced that it had established a relationship with GreenCrest Capital Management, a research firm, to improve its ability to offer institutional clients access to trading in private companies.⁹⁶

e. Opportunities for Unaccredited Investors

The secondary market ecosystem has broadened to allow unaccredited investors an opportunity to invest indirectly. Unaccredited investors have access through a layer of professional investors.⁹⁷ For example, GSV Capital Corp. formed in September 2010 “as an externally managed, non-diversified closed-end management investment company”, had its initial public offering on May 3, 2011, and now trades on Nasdaq (GSVC).⁹⁸ GSV Capital invests primarily in shares of private companies. GSVC Capital’s January 6, 2012 Form N-2 lists the following companies in its portfolio: Bloom Energy, Chegg, Control 4, DreamBox

⁹² *Wedbush Securities Expands Private Shares Group, Welcomes Emerging Growth, Internet, and Social Media Veteran*, Press Release, Wedbush Securities (December 1, 2011). Available at:

http://www.wedbush.com/sites/default/files/pdf/2011.12.1.PRESS_.HiringOfThomasWyman.FINAL_.pdf.

⁹³ *Id.*

⁹⁴ *Id.*

⁹⁵ *Telis Demos, GFI launches private shares group*, *The Financial Times* (December 1, 2011). Available at:

<http://www.ft.com/intl/cms/s/0/7c10dfa0-1a00-11e1-b9d7-00144feabdc0.html#axzz1f1KA2nDR>.

⁹⁶ *Liquidnet Launches Global Institutional Platform for Fast Growing Private-Company Shares Trading*, Press Release, Liquidnet Holdings Inc. (October 17, 2011). Available at:

<http://liquidnet.com/docs/liquidnetBuzz/pressReleases/2011/Kerner%20Announcement%20FINAL.pdf>.

⁹⁷ *Adam Oliveri, Panel - The Secondary Market Big Picturer*, SecondMarket Capitalize 2012 Conference, New York (February 15, 2012). Video available at: <https://www.secondmarket.com/discover/event-replay-capitalize-east>.

⁹⁸ *GSV Capital Corp., Quarterly Report (Form 10-Q)* (November 10, 2011). Available at:

http://www.sec.gov/Archives/edgar/data/1509470/000114420411063020/v239794_10q.htm.

Learning, DropBox, Facebook, Gilt Groupe, Grockit, Groupon, Kno, debt tied to the value of Zynga, Serious Energy, SharesPost, Silver Spring Networks, StormWind, The EchoSystem, The rSmart Group, TrueCar, Twitter, ZocDoc, and Zoom Systems. GSVC's share price has remained relatively stable since its IPO (see Figure 4).

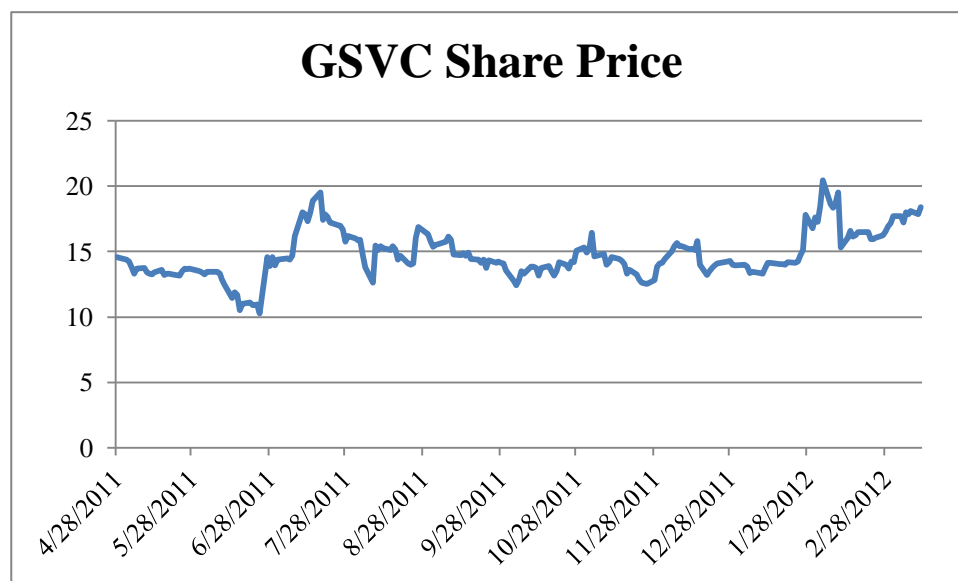


Figure 4⁹⁹

In December 2011, Keating Capital also began trading on Nasdaq (KIPO).¹⁰⁰ Keating is a business development company focusing on pre-IPO investments in high growth companies.¹⁰¹ Figure 5 illustrates the sectors and companies in which Keating Capital has invested. It has more recently invested in private companies Zoosk and Agilyx.^{102,103}

⁹⁹ *GVC Capital Corp (GSVC)*, Yahoo! Finance, <http://finance.yahoo.com/q/hp?s=GSVC+Historical+Prices>.

¹⁰⁰ *Keating Capital Lists Shares on Nasdaq*, Press Release, Keating Capital Inc. (December 12, 2011). Available at: <http://keatingcapital.com/wp-content/uploads/2011/09/Nasdaq-Listing-Press-Release-12-09-11-FINAL.pdf>.

¹⁰¹ *Business Development Company with Pre-IPO Focus*, Keating Capital Inc., <http://keatingcapital.com>.

¹⁰² Keating Capital Inc., Current Report (Form 8-K) (January 31, 2012). Available at: <http://www.sec.gov/Archives/edgar/data/1444706/000115752312000377/a50149844.htm>.

¹⁰³ *Pre-IPO Investor Leads Agilyx Financing*, Press Release, Keating Capital Inc. (December 19, 2011). Available at: <http://keatingcapital.com/wp-content/uploads/2011/09/Press-Release-Agilyx-Investment-12-15-11-FINAL.pdf>.

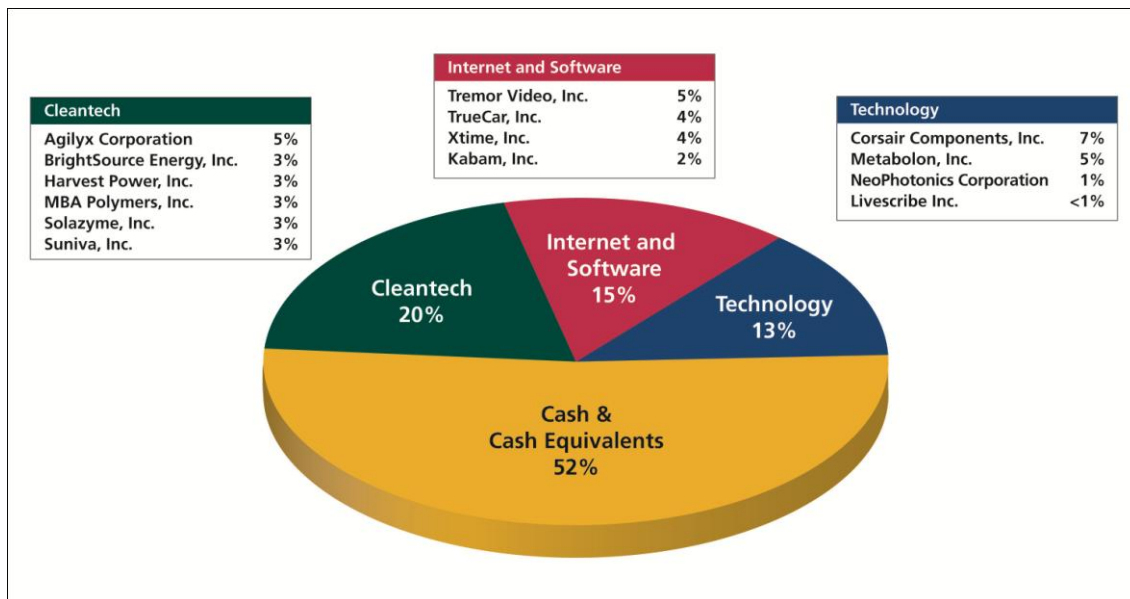


Figure 5 (source: Keating Capital, Inc.)¹⁰⁴

IV. MARKETPLACE RISKS AND BENEFITS

The rapid growth in secondary markets for private company shares is due in large part to the benefits available to both buyers and sellers. Secondary transactions can provide liquidity for shareholders at a time when the issuer is not ready for an exit. Buyers gain access to an alternative investment class. The benefits to both buyers and sellers, as well as the risks and benefits to the issuer, are discussed below.

a. Sellers

The liquidity needs of founders and employees are often not aligned with a company's needs. Personal situations, a desire for diversification, changes in employment, tax considerations and many other factors impact individuals in unique ways.¹⁰⁵ Sale through a

¹⁰⁴ *Portfolio Company Investment Allocation – Q4 2011*, Keating Capital Inc., <http://keatingcapital.com/portfolio-companies/portfolio-by-industry> (2012).

¹⁰⁵ Ken Sawyer, Zack Scott and Balazs Veress, *A Guide to Secondary Transactions: Alternative Paths to Liquidity in Private Companies*, Saints Capital (2010). Available at: http://www.saintsvc.com/wp-content/uploads/2011/11/Secondary_Marketing_Booklet_FINAL_VERSION-9.7.11.pdf.

secondary market allows individuals to secure the liquidity they need regardless of the issuer's particular needs at that time. This interim liquidity reduces the risk for the entrepreneurs and allows them to focus on growing the company, rather than personal financial issues.¹⁰⁶

The liquidity needs of venture capitalists also often differ from those of the issuer. Older vintage funds may wish to wind down their investments and return capital to their limited partners.^{107,108} Early stage venture capitalists may seek to exit from larger companies so they can focus on earlier stage companies where they provide more value add.¹⁰⁹ A fund may have insufficient reserves for a follow-on round and can sell to an investor with the capacity to make the additional investment.¹¹⁰ A venture capitalist may disagree with a board's strategic direction or the fund's area of focus may have shifted.¹¹¹

b. Buyers

Buyers in the secondary markets benefit from access to investments that might not otherwise be available to them. Existing investors may wish to increase their stake in a company.¹¹² New investors may desire access that was not available in primary rounds.¹¹³ Transaction costs are reduced allowing for more efficient allocation of buyers' capital.

¹⁰⁶ Paul Deninger, *Panel – The Secondary Market vs. Going Public*, SecondMarket Capitalize 2011 Conference, San Francisco. (May 11, 2011). Video available at: <https://www.secondmarket.com/discover/capitalize>.

¹⁰⁷ Ken Sawyer, Zack Scott and Balazs Veress, *A Guide to Secondary Transactions: Alternative Paths to Liquidity in Private Companies*, Saints Capital (2010). Available at: http://www.saintsvc.com/wp-content/uploads/2011/11/Secondary_Marketing_Booklet_FINAL_VERSION-9.7.11.pdf.

¹⁰⁸ Hans Swildens, *Venture Capital Secondary Funds – The Third Exit Option: A smart way to improve fund performance and unlock hidden value*, Industry Ventures LLC White Paper (May 2008). Available at: http://www.industryventures.com/pdf/Venture_Capital_Secondaries_White_Paper.pdf.

¹⁰⁹ Duncan Davidson, *Panel - The Secondary Market Big Picturer*, SecondMarket Capitalize 2012 Conference, New York (February 15, 2012). Video available at: <https://www.secondmarket.com/discover/event-replay-capitalize-east>.

¹¹⁰ Ken Sawyer, Zack Scott and Balazs Veress, *A Guide to Secondary Transactions: Alternative Paths to Liquidity in Private Companies*, Saints Capital (2010). Available at: http://www.saintsvc.com/wp-content/uploads/2011/11/Secondary_Marketing_Booklet_FINAL_VERSION-9.7.11.pdf.

¹¹¹ *Id.*

¹¹² *Id.*

¹¹³ *Id.*

c. Issuers

When handled appropriately, many of the advantages to sellers can translate into advantages for the issuer. Secondary transactions can be used to retain and motivate employees.¹¹⁴ The company benefits when employees are able to focus on company growth rather than personal financial concerns.¹¹⁵ The incentive value of equity compensation can become a stronger motivator when employees are able to cash out a portion of their shares. However, companies are understandably cautious about allowing existing employees to sell all of their shares. The fear is that employees will lose motivation and therefore companies limit sales to a percentage of vested shares.^{116,117} On the other hand, where sales by former employees are unrestricted, existing employees may consider leaving if necessary to achieve liquidity.¹¹⁸

Issuers can benefit in several ways by bringing in new investors and removing old. Unhappy investors can leave allowing for better board dynamics.¹¹⁹ The pressure to exit earlier than the issuer feels appropriate can be reduced if each investor is able to select their own timeline through the secondary market.¹²⁰ The capitalization table can be cleaned up, which is of particular benefit for companies approaching the SEC's 500 shareholder limit (beyond which

¹¹⁴ *Id.*

¹¹⁵ *Panel – The Secondary Market vs. Going Public*, SecondMarket Capitalize 2011 Conference, San Francisco. (May 11, 2011). Video available at: <https://www.secondmarket.com/discover/capitalize>.

¹¹⁶ Tom Sansone, *Panel - The Secondary Market – The Value Proposition*, SecondMarket Capitalize 2012 Conference, New York (February 15, 2012) (limit liquidity to 10-25% of the vested amount). Video available at: <https://www.secondmarket.com/discover/event-replay-capitalize-east>.

¹¹⁷ Annemarie Tierney, *Panel - Secondary Transaction Mechanics and Primer*, SecondMarket Capitalize 2012 Conference, New York (February 15, 2012) (SecondMarket listed its own shares and allowed existing employees to sell up to 20% of their holdings. There were no limitations on the amount sold by ex-employees). Video available at: <https://www.secondmarket.com/discover/event-replay-capitalize-east>.

¹¹⁸ Ken Sawyer, Zack Scott and Balazs Veress, *A Guide to Secondary Transactions: Alternative Paths to Liquidity in Private Companies*, Saints Capital (2010). Available at: http://www.saintsvc.com/wp-content/uploads/2011/11/Secondary_Marketing_Booklet_FINAL_VERSION-9.7.11.pdf

¹¹⁹ *Id.*

¹²⁰ *Id.*

there are enhanced reporting requirements similar to those of going public).^{121,122} Secondary transactions can be conducted in concert with primary rounds, bringing in new investors through a secondary transaction who are also able to participate in follow-on primary rounds.¹²³

Transactions in the secondary markets can bring added credibility to private companies that could raise the likelihood of later merger and acquisition transactions.¹²⁴ The secondary markets can provide pricing validation and can also include a vetting process that has the potential to act as a preliminary filter for those seeking acquisition targets. The secondary markets can also allow companies to stay private longer, which can allow them to remain competitive (less disclosure is available to competitors) and focused on growth (rather than meeting public company requirements).¹²⁵

Secondary transactions normally require some level of information exchange (often to both buyers and sellers, many of whom are former employees), which can be a concern for issuers. Issuers also need to be wary of the SEC's 500 shareholder rule, which, if triggered, would require reporting similar to that of a public company.¹²⁶ Prices from secondary transactions may need to be used in 409A valuations (an IRS regulation covering nonqualified deferred compensation, such as options) impacting the level of benefits available to

¹²¹Michael Pitts, *Panel - The Secondary Market – The Value Proposition*, SecondMarket Capitalize 2012 Conference, New York (February 15, 2012). Video available at: <https://www.secondmarket.com/discover/event-replay-capitalize-east>.

¹²²Ken Sawyer, Zack Scott and Balazs Veress, *A Guide to Secondary Transactions: Alternative Paths to Liquidity in Private Companies*, Saints Capital (2010). Available at: http://www.saintsvc.com/wp-content/uploads/2011/11/Secondary_Marketing_Booklet_FINAL_VERSION-9.7.11.pdf

¹²³*Id.*

¹²⁴Michael Pitts, *Panel - The Secondary Market – The Value Proposition*, SecondMarket Capitalize 2012 Conference, New York (February 15, 2012). Video available at: <https://www.secondmarket.com/discover/event-replay-capitalize-east>.

¹²⁵Ken Salgado and Ellen S. Bancroft, *The Benefits—and Risks—of Secondary Markets for Private Shares*, NVCA Today (October 24, 2011). Available at: <http://nvcatoday.nvca.org/index.php/from-our-sponsors/the-benefitsand-risksof-secondary-markets-for-private-shares.html>.

¹²⁶*Q&A: Small Business and the SEC*, U.S. Securities and Exchange Commission, <http://www.sec.gov/info/smallbus/qasbsec.htm> (November 14, 2009).

employees.¹²⁷ These risks associated with secondary transactions are mitigated by the increasing level of company control over transactions.

V. WHY NOW

The benefits that secondary markets offer have gained importance in the last decade. A dramatic decrease in IPOs has persisted since 2001, as illustrated in Figure 6 below.¹²⁸ This decrease and the associated increase in holding periods for shareholders have placed significant pressure on individuals seeking liquidity.¹²⁹ These individuals make up a relatively large group of willing sellers. The tremendous success of the social media sector in the last few years, driven in large part by Facebook, has generated a group of willing buyers. This combination of willing buyers and willing sellers at a time when IPOs have become rare is a likely cause of the rise in secondary marketplaces. Because social media companies have been such a big driver of secondary market success, many question whether the secondary marketplaces will continue to thrive once the key social media companies have all gone public.^{130,131,132}

¹²⁷ 409A Nonqualified Deferred Compensation Plans, IRS (May 4, 2011) <http://www.irs.gov/retirement/article/0,,id=186222,00.html>.

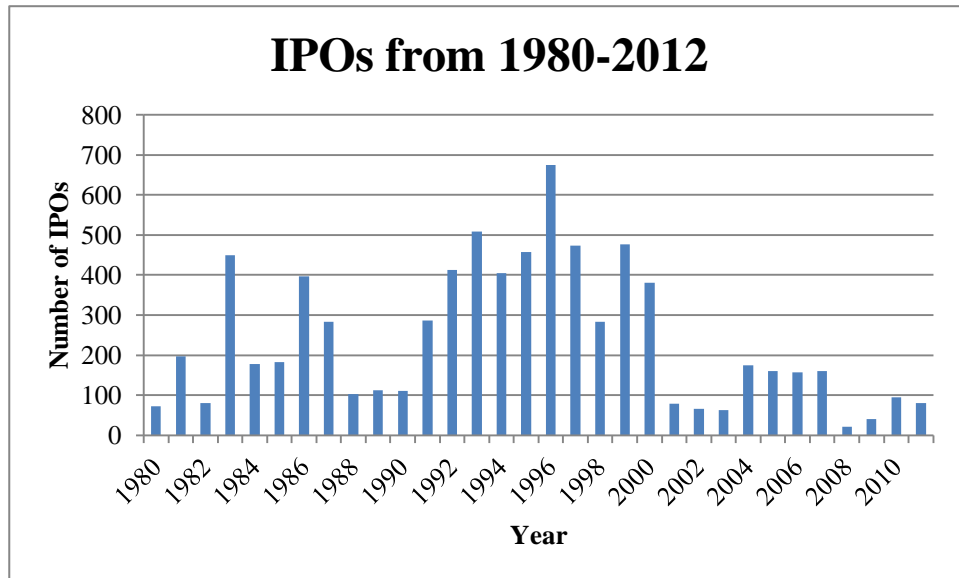
¹²⁸ *The Future of Capital Formation: Hearing Before the House Committee on Government and Oversight Reform*, 112th Congress (May 10, 2011) (statement of Mary Schapiro, Chairman, Securities and Exchange Commission). Available at: http://oversight.house.gov/images/stories/Testimony/5-10-11_Schapiro_Capital_Formation_Testimony.pdf

¹²⁹ Paul Deninger, *Panel – The Secondary Market vs. Going Public*, SecondMarket Capitalize 2011 Conference, San Francisco. (May 11, 2011). Video available at: <https://www.secondmarket.com/discover/capitalize>.

¹³⁰ Maureen Farrell, *Facebook IPO shrinks private trading market*, CNN Money (February 3, 2012). Available at: http://money.cnn.com/2012/02/03/markets/facebook_second_market/index.htm.

¹³¹ Steven Russolillo, *What's Next For Private Stock Markets After Big Web IPOs?*, WSJ Blogs (October 27, 2011). Available at: <http://blogs.wsj.com/venturecapital/2011/10/27/whats-next-for-private-stock-markets-after-big-web-ipos>.

¹³² April Dembosky, *Facebook to be keenly missed by private markets*, Financial Times (February 6, 2012). Available at: <http://www.ft.com/cms/s/0/493319b6-50ee-11e1-8cdb-00144feabdc0.html#axzz1o6xUPGj5>.



Data source: Jay R. Ritter, *Initial Public Offerings: VC-backed IPO Statistics Through 2011* (Dec 31, 2012).¹³³

Figure 6

VI. FROM SECONDARY MARKET TO IPO

There have been relatively few companies traded in the secondary marketplace that have gone IPO. For the five companies for which data is available, SharesPost, IPO, and subsequent Nasdaq prices are presented.¹³⁴ As illustrated below, there is no clear path that share price takes through the process. The secondary market price is becoming a more important factor in pricing shares (particularly for option grants); several companies have made reference to secondary market prices in their registration statement (Form S-1) filings with the SEC.

a. Tesla Motors

Tesla Motors was one of the first companies to transition from secondary to public market. The path of Tesla Motor’s share price through the transition is illustrated in Figure 7.

¹³³ Available at: <http://bear.warrington.ufl.edu/ritter/IPOs2011VC-backed%20IPOs1912.pdf>.

¹³⁴ SharesPost is the only private company secondary marketplace that makes a significant portion of its transaction data available. SharesPost data was supplemented with information from Bloomberg and Internet searches.

The roughly \$10 secondary market price was followed by a \$17 IPO. The company then traded well above the IPO price for several days, dipped slightly below, then increased.

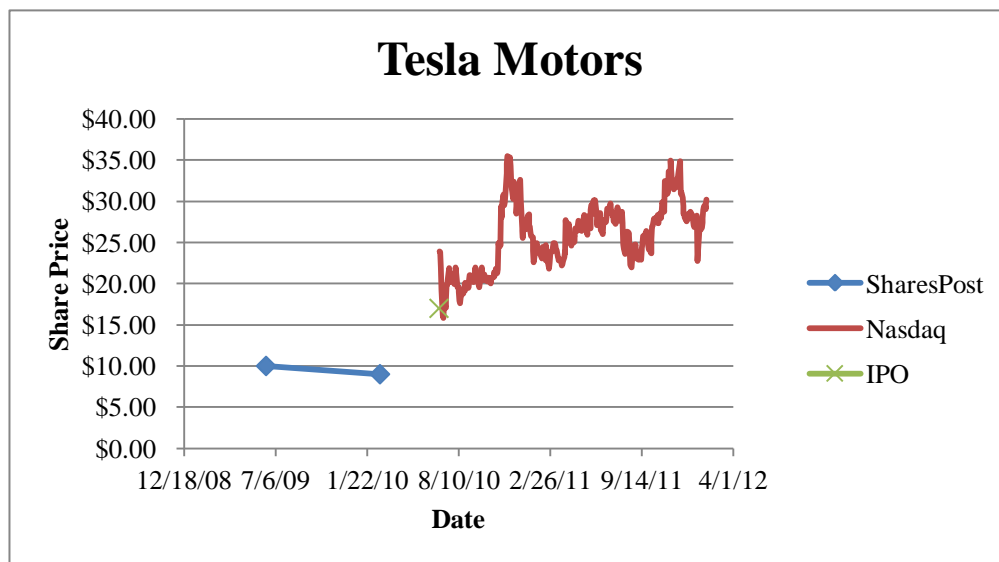


Figure 7

b. LinkedIn

LinkedIn represents another successful secondary to public market transition, as illustrated in Figure 8. The secondary market price increased steadily to over \$30, the IPO was priced above at \$45, and then the Nasdaq price increased dramatically, closing at over \$94 the first day (some would argue, a case of too much underpricing).¹³⁵

¹³⁵ Joe Nocera, *Was LinkedIn Scammed?*, New York Times (May 20, 2011). Available at: http://www.nytimes.com/2011/05/21/opinion/21nocera.html?_r=1.

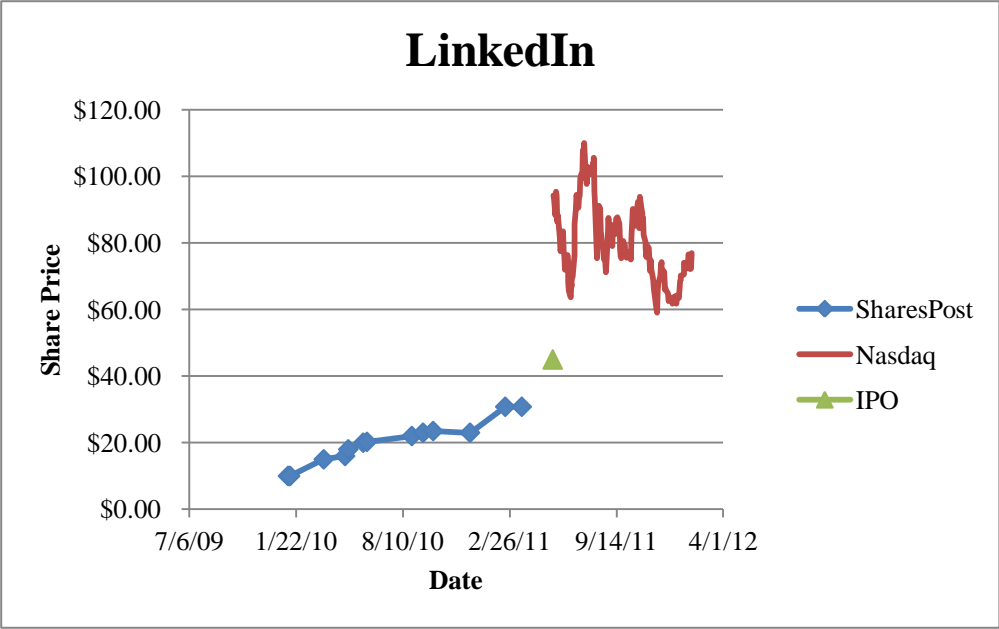


Figure 8

c. Fusion-io

Fusion-io followed a path similar to LinkedIn (see Figure 9). The company traded at \$15 in the secondary marketplace, went IPO at \$19, and closed it first day at \$22.5.

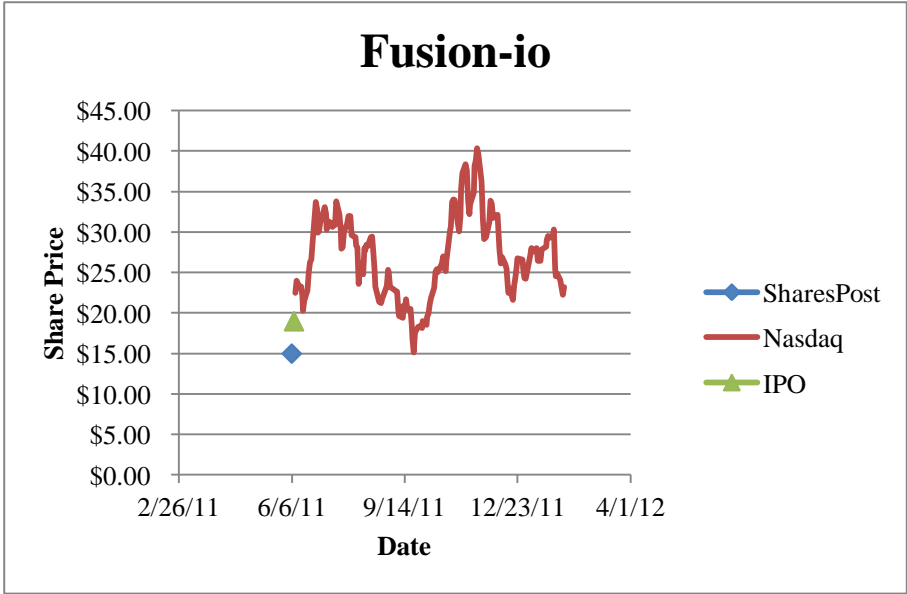


Figure 9

d. Jive Software

Jive Software’s IPO was priced at \$12, below its secondary market price of \$12.50 roughly six months earlier (see Figure 10). Unfortunately, secondary market prices closer to the IPO were unavailable. Following the IPO, the company’s price jumped to over \$15.

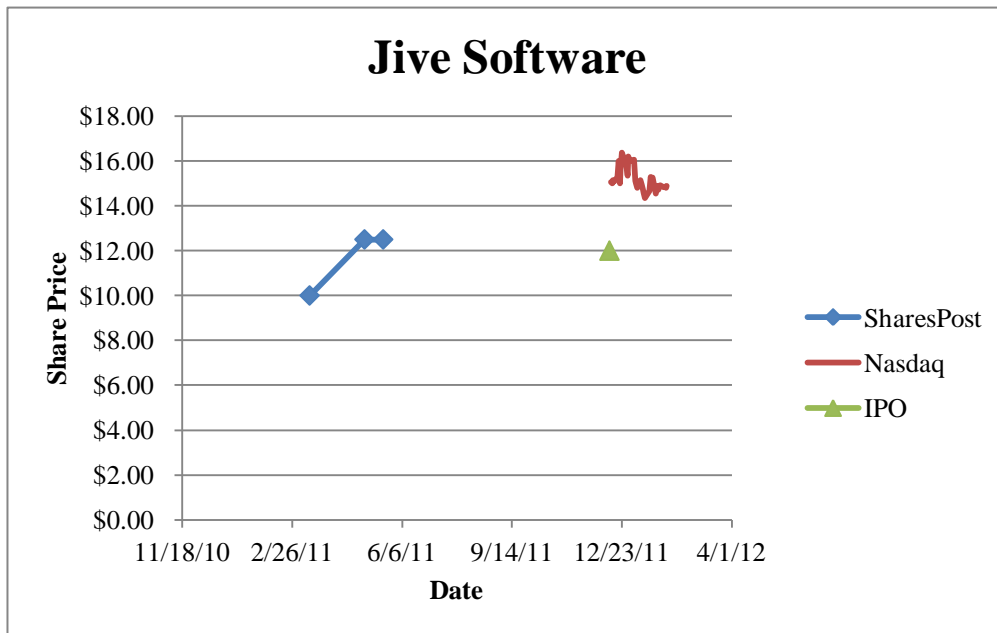


Figure 10

e. Zynga

Zynga’s IPO price was set substantially below its secondary market price. After steadily rising to \$20 on SharesPost, Zynga went IPO at \$10, and then had a \$9.50 first day close on Nasdaq, as illustrated in Figure 11.

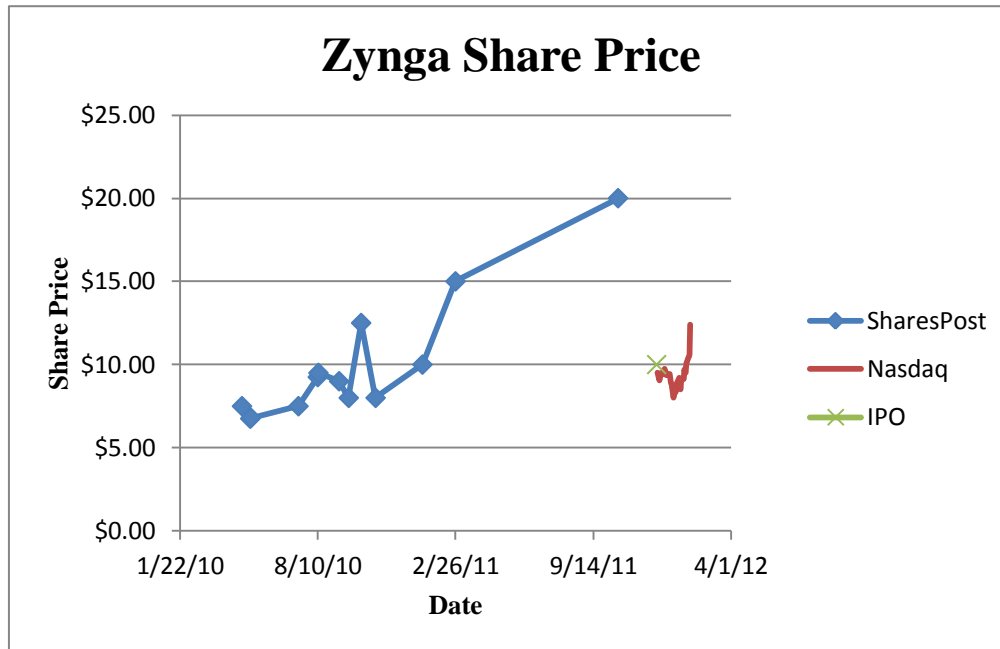


Figure 11

f. Registration Statements (Form S-1)

Several recent SEC registration statement filings (Form S-1) make reference to transactions taking place on secondary markets, indicative of the growing influence of these transactions and their use in valuation of common stock. Brightcove Inc., for example, stated in its August 24, 2011 S-1 filing that both management and the board believe that “secondary transaction made by nonemployee investors” and a “contemporaneous valuation...are the best indicators of the fair value of our common stock” for purposes of valuing certain stock options.^{136,137}

In its listing of risks in its S-1 filing, LinkedIn Corporation states that “[p]rior to this offering, there has been no public market for our Class A common stock, and there has been no public market for our Class B common stock other than the limited trading that has occurred on

¹³⁶ *Brightcove Announces Pricing of Initial Public Offering*, Press Release, Brightcove (February 17, 2012). Available at: <http://investor.brightcove.com/releasedetail.cfm?ReleaseID=649556>.

¹³⁷ Brightcove Inc., Registration Statement (Form S-1) (August 24, 2011). Available at: <http://www.sec.gov/Archives/edgar/data/1313275/000119312511230151/ds1.htm>.

alternative online markets, such as SecondMarket and SharesPost, which has been occurring on a speculative basis.” Jive Software indicated in its S-1 filing that the company had adjusted the weighting of certain scenarios in its valuation “due to the increased number of secondary transactions in our common stock”¹³⁸. Jive Software relied “more heavily on market indicators as opposed to income approach metrics. Market indicators include both secondary market transactions and estimates of future revenue multiples.”¹³⁹ Jive Software also made reference to the volume and pricing of specific secondary market transactions.¹⁴⁰

Zynga’s S-1 discussed the significant number of secondary transactions in its common stock that occurred since the fourth quarter of 2009 and how their pricing “was the primary basis for determining the fair value of our common stock and Series Z preferred stock....”¹⁴¹ Zynga’s board determined the terms of the transactions “approximated those that would be obtained in an arms-length transaction” where the participants “included highly knowledgeable, informed and sophisticated parties as both buyers and sellers....”¹⁴² Zynga also made reference to the volume and pricing of several transactions involving purchases from current employees and early investors.¹⁴³

Facebook’s S-1’s only reference to secondary markets is in its discussion of “an inquiry into secondary transactions involving the sale of private company securities as well as the number of our stockholders of record” by the Enforcement Division of the Securities and

¹³⁸ Jive Software Inc., Registration Statement (Form S-1) (August 24, 2011). Available at: <http://www.sec.gov/Archives/edgar/data/1462633/000119312511231091/ds1.htm>.

¹³⁹ *Id.*

¹⁴⁰ *Id.*

¹⁴¹ Zynga Inc., Registration Statement (Form S-1) (July 1, 2011). Available at: <http://www.sec.gov/Archives/edgar/data/1439404/000119312511180285/ds1.htm>.

¹⁴² *Id.*

¹⁴³ *Id.*

Exchange Commission (SEC).¹⁴⁴ Yelp notes in its S-1 risks, which were also noted by LinkedIn: “These markets are speculative, and the trading price of our securities on these markets is privately negotiated. We cannot assure you that the price of our Class A common stock will equal or exceed the price at which our securities have traded on these private secondary markets.”¹⁴⁵

VII. PREDICTIVE VALUE OF SECONDMARKET WATCHERS

The increasing importance of secondary markets makes them a potentially useful source of data for predicting the pricing of companies’ IPOs. As discussed above, in March 2011 SecondMarket launched its “watcher” feature to provide investors with a way of tracking companies of interest. I conduct a regression analysis to identify correlations between the number of watchers just prior to an IPO and the short-term change in share price after IPO.

a. Regression Analysis of 2011 IPOs

There were 42 venture-backed IPOs in the United States in 2011.¹⁴⁶ SecondMarket began its watcher program in March, so the following analysis focuses on the 28 venture-backed companies that went public between April and December 2011. Monthly watcher data for these companies was provided by SecondMarket.¹⁴⁷ The number of watchers just before the IPO was estimated as the average number of watchers at the start of the month in which the IPO occurred

¹⁴⁴ Facebook Inc, Registration Statement (Form S-1) (February 1, 2012). Available at:

<http://www.sec.gov/Archives/edgar/data/1326801/000119312512034517/d287954ds1.htm>.

¹⁴⁵ Yelp Inc., Registration Statement (Amendment No. 3 to Form S-1)(February 3, 2012). Available at:

<http://www.sec.gov/Archives/edgar/data/1345016/000119312512039103/d245328ds1a.htm>.

¹⁴⁶ R. Ritter, *Initial Public Offerings: VC-backed IPO Statistics Through 2011* (Dec 31, 2012). Available at:

<http://bear.warrington.ufl.edu/ritter/IPOs2011VC-backed%20IPOs1912.pdf>. A special thanks to Professor Jay Ritter for his advice and assistance with the IPO data.

¹⁴⁷ A special thanks to Aishwarya Iyer of SecondMarket for providing the monthly watcher data.

and the start of the subsequent month.¹⁴⁸ Companies are not removed from a watchlist after IPO unless actively requested by a user so this average is expected to yield a very good estimate of the number of watchers just before IPO.

I regress the 1-day, 5-day, and 20-day change in share price from the IPO offer price on the estimated number of watchers on SecondMarket just before the IPO. The change in share price is calculated by subtracting the IPO offer price from the Nasdaq closing price one, five, and twenty days after IPO and then dividing by the IPO price. The data do not support a linear relation between the number of watchers and subsequent share price changes (p-values greater than 5%). This is understandable: an additional watcher on Facebook (with thousands of watchers) would not be expected to have the same impact as the addition of a watcher to a company with no or just a few watchers.

When I instead regress the 1-day change in share price on the log of the number of watchers (plus one to address companies with zero watchers), I find statistically significant results:

$$\text{1-day percent change} = 0.0699 + 0.107 \log(\text{watchers}+1)$$

with an R-squared of 26.3% and a p-value on the coefficient of interest of 0.005. Figure 12 plots the 1-day percent change versus $\log(\text{watchers}+1)$ and shows the relatively strong correlation between the two, particularly at lower numbers of watchers. In contrast, the log of the number of watchers is not significantly related to share price changes over longer (5-day and 20-day) windows.

¹⁴⁸ For example, Zynga's IPO was December 15, 2011. The number of watchers on December 1, 2011 was 5216 and the number on January 1, 2012 was 5276. The number of watchers on the IPO date was estimated as the average, or 5246.

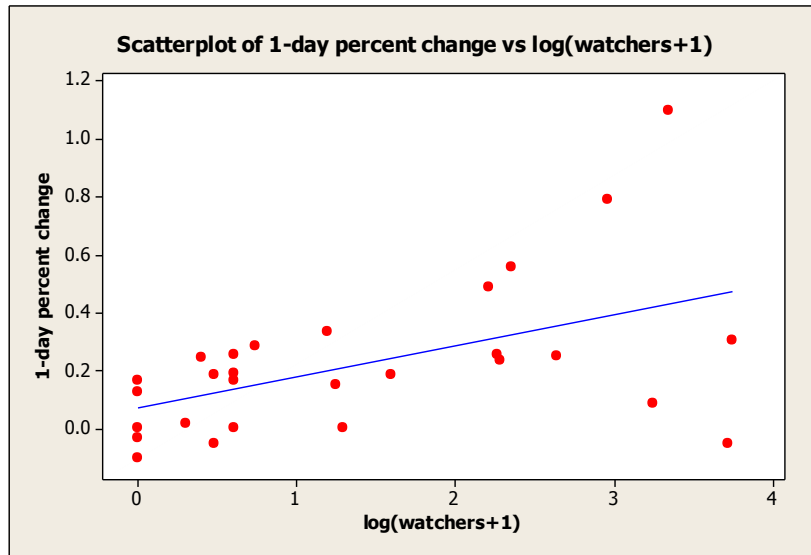


Figure 12

My one-day regression is influenced by an outlier, LinkedIn, whose share price jumped over 100% on the first day of trading. Removing the LinkedIn outlier results in the following regression equation:

$$\text{1-day percent change} = 0.0920 + 0.0720 \log(\text{watchers}+1)$$

with an R-squared of 18.8% and a p-value of 0.024. Figure 13 plots the 1-day percent change versus log(watchers+1) with LinkedIn removed.

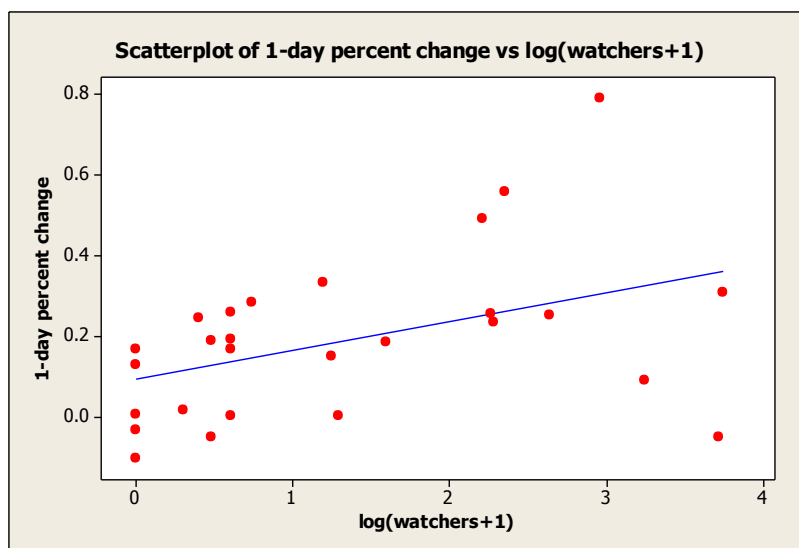


Figure 13

b. Updated Regression with 2012 IPOs

As of March 13, 2012 there have been approximately 13 venture-backed IPOs in 2012. I gathered watcher data from SecondMarket.com for each of these companies for the day before IPO. When the 2012 venture-backed IPOs are included in the regression, the estimated correlation between the number of watchers and the share price increase on the first day of trading increases from 0.0720 to 0.0893, with a p-value close to zero:

$$\text{1-day percent change} = 0.0619 + 0.0893 \log(\text{watchers}+1)$$

Figure 14 plots the 1-day percent change versus $\log(\text{watchers}+1)$ with the 2012 venture-backed IPO data included.

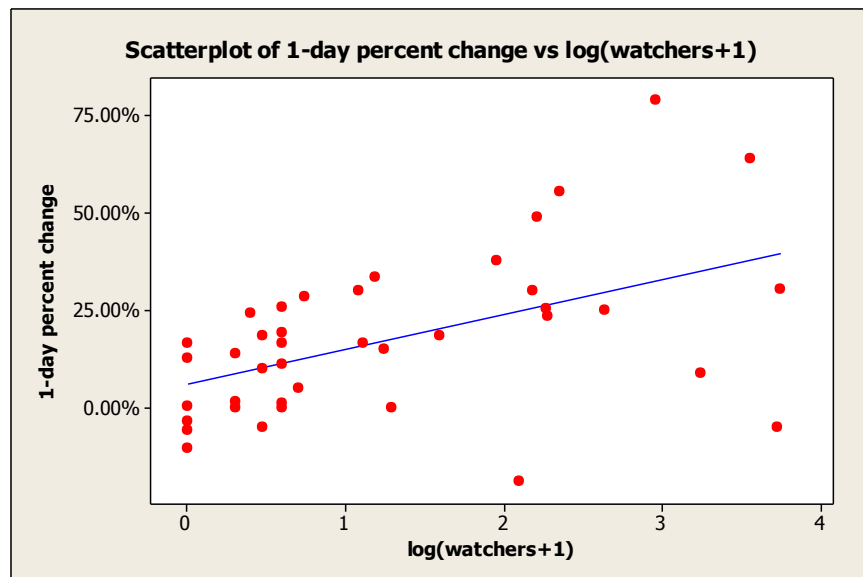


Figure 14

The correlation between the number of watchers and the first-day change in price indicates that SecondMarket watcher data may be a useful factor for investment banks to consider when setting a company's IPO price.

VIII. CONCLUSION

The rapidly evolving marketplace for private company shares has seen the emergence of many new players in the last few years. This trend is expected to continue, particularly as regulatory issues are addressed and changes to the legislative framework are considered.^{149,150} Secondary marketplaces will likely play a key role in companies' decisions on if and when to go public. Transaction pricing and other secondary market data are expected to become a more critical factor in IPO pricing and in valuing options for 409A purposes.

¹⁴⁹ Randall Smith and Jean Eaglesham, *SEC Cracks Down on Pre-IPO Trading*, Wall Street Journal (March 14, 2012). Available at: <http://online.wsj.com/article/SB10001424052702304692804577281844105719500.html>.

¹⁵⁰ *Legislative and Regulatory Proposals Affecting Capital Raising*, Morgan, Lewis & Bockius LLP White Paper (March 2012). Available at: http://www.morganlewis.com/pubs/BF-WhitePaper_LegislativeRegulatoryProposals_March2012.pdf.

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I wish to express my thanks to Professors Alexander Ljungqvist and William Silber of the NYU Stern Department of Finance for their valuable advice and guidance.

**The Impact of Large-Scale Asset Buybacks on
Relative Valuation of U.S. Treasury Securities**

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April 2, 2012

I. INTRODUCTION

The decision by the Federal Reserve to engage in Large Scale Asset Buybacks as a way of performing monetary policy has sparked much interest across the academic world. However, although there have been several analyses on the impact of those buybacks on long-term interest rates and overall macroeconomic effects, there hasn't been much research done on the impacts of those purchases on the microstructure of Treasury securities. Therefore, the purpose of this work is to fill this gap by analyzing the impact of the buybacks (also known as QE1 and QE2) on the relative pricing of US Treasury Securities across maturities and coupons.

The 2008 financial crisis caused many disruptions across asset classes and the U.S. treasuries market was no exception. The special condition of U.S treasury securities as "safe-haven" securities caused huge inflows in this asset class in the aftermath of the financial crisis and may have caused mispricing in the relative valuation of bonds across the yield curve. Moreover, as the crisis reduced overall market liquidity and increased risk premia, arbitrageurs who would normally exploit those mispricings might not have been able to do so due to impaired balance sheets.

However, there was one market participant who did not suffer from balance sheet restrictions. By engaging in its Large-Scale Asset Purchases (LSAP) programs, the Federal Reserve purchased over \$900 billion of Treasury Securities from 2009 to 2011. In its operational statements, the Fed announced the maturities that it would purchase, but

let the actual securities purchased to be decided by competitive auction. Accordingly to the Federal Reserve operational statements¹:

“Consistent with prior outright Treasury purchases, these purchases will be conducted with the Federal Reserve’s primary dealers through a series of competitive auctions via the Desk’s FedTrade system.”

In order to correctly assess which offers to take in the competitive auction system, the Federal Reserve must have some internal methodology in order to assess whether a particular treasury security is “cheap” or “expensive” at a particular price. Although there is no official information on the methodology used, it will probably utilize some form of curve spline fit as described in (Waggoner, 1997).

Therefore, as the Federal Reserve implements its treasury purchase program, one should expect the mispricing of Treasury Securities with similar maturities to decrease. As the Fed purchases of securities it deems “cheap”, it bids up their price thus reducing the mispricing. There could also be an indirect impact, as the QE program improves overall market conditions and the increased liquidity allows arbitrageurs to return to the market and exploit any opportunity they see.

This paper will try to quantify those impacts by analyzing the yield differential between On-The-Run (OTR) and Off-The-Run (OFR) securities of same maturity. The next two sections will describe how the OFR-OTR spread was measured and describe the

¹ Federal Reserve Website, http://www.newyorkfed.org/markets/operating_policy_090318.html

Federal Reserve LSAP program in details. Then, sections IV and V will describe the methodology used to quantify the impact of the LSAP program on the OFR-OTR spread and analyze the results. Section VI will try to assess whether there was a difference between QE1 and QE2 in terms of the impact of those programs on the OFR-OTR spread and finally section VII will conclude and suggest other areas for future research.

II. MEASURING THE OFR-OTR SPREAD

In order to measure the impact of LSAP on the OFR-OTR spread, it is important to first define how to measure this spread across different maturities and coupons. U.S. Treasury Notes and Bonds are issued in fixed maturities such as 2, 3, 5, 7, 10 or 30 years. For each one of these fixed maturities, the OFR-OTR spread will be defined as follows:

$$\Delta YTM = YTM^{OFR} - YTM^{OTR}$$

Where:

YTM^{OTR} = Yield to Maturity of the mostly recently issued security for this fixed maturity (On-The-Run bond)

YTM^{OFR} = Yield to Maturity of a synthetic off-the-run bond with same maturity

The synthetic off-the-run bond will be calculated by linear interpolation of the YTM of securities with neighboring maturities as in (Amihud & Mendelson, 1991):

$$YTM^{OFR} = YTM^{PREV} \times w^1 + YTM^{NEXT} \times w^2$$

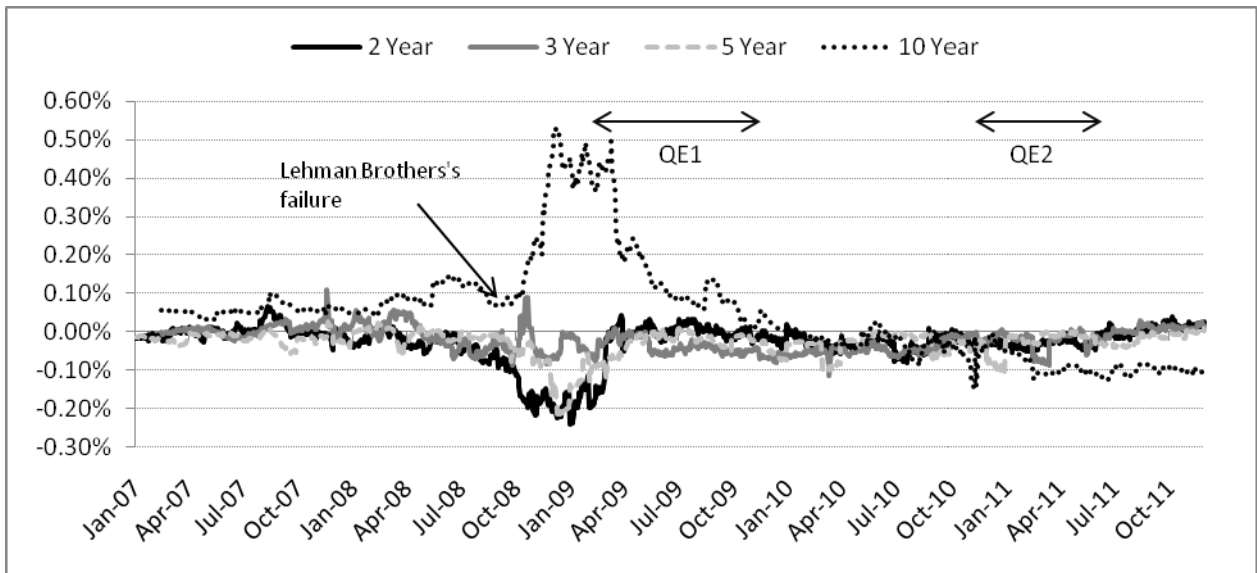
Where PREV is the bond that matures just before the OTR bond and NEXT is the bond that matures just after the OTR bond. The weights are defined accordingly to standard linear interpolation:

$$w^1 = (\text{Maturity}^{\text{NEXT}} - \text{Maturity}^{\text{OTR}}) / (\text{Maturity}^{\text{NEXT}} - \text{Maturity}^{\text{PREV}})$$
$$w^2 = (\text{Maturity}^{\text{OTR}} - \text{Maturity}^{\text{PREV}}) / (\text{Maturity}^{\text{NEXT}} - \text{Maturity}^{\text{PREV}})$$

In order to calculate those spreads, this work will utilize daily closing bond yields for U.S. Treasury Bonds from January/2008 to November/2011 as collected from Reuters DataStream and Bloomberg. The OFR-OTR spreads will be calculated for 2, 3, 5 and 10 year securities. 7 year securities will not be included as they started to be issued on March/2009, so there wouldn't be a time period without the Fed's purchases in order to compare the spreads. Also, 30 year securities will not be included as there is no OFR bond with the same or higher maturity than the currently issued bond.

The graph below shows the OFR-OTR spreads of different treasury securities from 2008 to late 2011:

FIGURE 1 – OFR-OTR SPREADS FOR DIFFERENT MATURITIES



By analyzing this graph is possible to see the disruptions that the financial crisis caused on the U.S. securities markets. For the 10-year bond, the OFR-OTR premium increased markedly during the financial crisis. However, for other treasury securities the spread became negative. As the securities being compared have different coupons and slightly different durations, this spread should reflect part of those differences. Also, as noted in (Longstaff, 2002), this spread should also reflect differences in liquidity, tax treatment or repo specialness across securities.

However, even after accounting for those other factors, the negative spreads for short-term notes during the September/2008 and March/2009 period are puzzling and require further analysis. It is important to remember that markets were subject to extreme dislocations during this period, and participants that would normally take advantage of relative mispricings in the treasuries markets had their balance sheets impaired.

Therefore, a large volume of trading flows could have caused the spread of short-term notes to become negative during this period without attracting countervailing flow from dealers, hedge funds or other arbitrageurs. Moreover, due to differences in market segmentation, the 10-year bond spread could have moved in the opposite direction of the short-term spread for a short period. As market conditions improved, both spreads started moving together again as expected.²

The difference between short and long-term spreads can also be explained by liquidity factors. One possible explanation is that dealers, who are usually the main holders of on-the-run securities, had to sell those securities hastily in order to improve their balance sheets. Therefore, the yields of short-term on-the-run bonds dropped when compared to their off-the-run equivalents. Another possible explanation is that the Financial Crisis caused a huge inflow into riskless securities, into a classic flight-to-quality effect. Short-term notes are the classic riskless security, and thus there might be a huge inflow of investor money into those bonds. Given that there is a limited amount of on-the-run securities available for each maturity, it is possible that this huge inflow went directly for off-the-run securities, which then became more liquid and therefore commanded a higher price than their on-the-run equivalents, causing a negative OFR-OTR spread. As long-term bonds are riskier than short-term notes, the inflow into those bonds was not as excessive, and thus their OFR-OTR spread increased instead.

² Special thanks for Dr. Kenneth Garbade from the New York Fed for the comments about those results

In order to test this, we are going to regress the level of the OFR-OTR spread against the market volatility, as expressed in the VIX. The model will have the following form:

$$\Delta \text{YTM} = a_0 + a_1 \text{VIX}$$

Where:

$$\Delta \text{YTM} = \text{YTM}^{\text{OFR}} - \text{YTM}^{\text{OTR}}$$

VIX = Daily closing value of the VIX index

The results are as follow (in bps):

	Constant	VIX	R²	Durbin-Watson
2 year	4.10 (***)	-0.27 (***)	0.35	0.097
3 year	-1.66 (**)	-0.02	0.00	0.087
5 year	0.56	-0.13 (***)	0.18	0.075
10 year	-13.76 (***)	0.72 (***)	0.37	0.038

For notes up to 5 years of maturity, the impact of higher volatility was in the direction of lower spreads, which is consistent with the negative spreads seen during the height of the Financial Crisis. On the other hand, for the 10 year notes, the impact of higher volatility was in the opposite direction, resulting in higher spreads.

It is important to note that there is significant autocorrelation in the residuals, as can be seen in the very low Durbin-Watson numbers. Therefore, it is important to estimate robust standard errors in order to assess the statistical significance of the coefficients. The results above were estimated using Newey-West estimators³.

Those results should be taken with some grain of salt, as trying the same model on the changes in spreads instead of the levels yields no significant results. Nevertheless, even if some other factor caused the OFR-OTR spreads to become negative, there is still some evidence of the correlation between higher volatility and lower OFR-OTR spreads for short-term securities.

III. LARGE SCALE ASSET PURCHASES

Beginning in March/2009, the Federal Reserve announced it would begin a \$300 billion Treasury purchase program in order to improve conditions in the private credit markets (QE1). Later, in November/2010, the Fed announced another purchase program

³ The model was estimated using EViews under non pre-whitened Bartlett Kernel with fixed bandwidth of 6 similar to (Stock & Watson, 2007)

(QE2) that would totalize \$600 billion. Moreover, the Fed would reinvest the coupon and principal payments of its existing holdings into new treasury purchases, which would bring the total value of purchases over \$1.2 trillion⁴. Although almost half of the purchases were concentrated on the 5-10 year segment of the yield curve, the Fed purchased securities across the entire curve, as can be seen below:

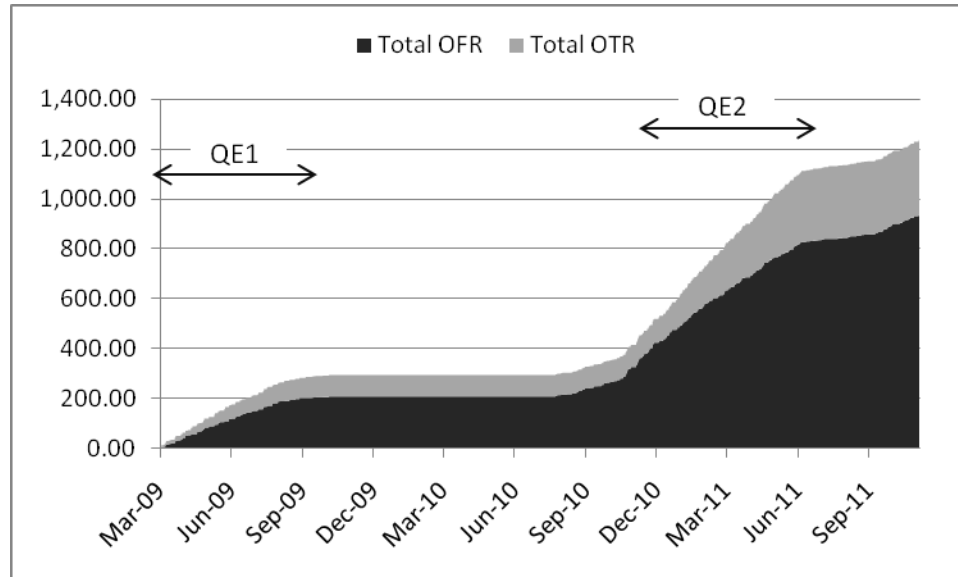
TABLE 1 – FEDERAL RESERVE TREASURY PURCHASES

	QE 1	QE 2	Reinvestment	Total
2 year	28.1	41.7	8.3	78.1
3 year	72.5	154.5	15.8	242.8
5 year	70.7	183.1	29.8	283.5
7 year	59.7	190.8	56.8	307.3
10 year	45.2	155.9	43.9	245.0
30 year	19.3	31.1	30.2	80.6
Total	295.4	757.0	184.9	1,237.3

Those purchases were distributed across On-The-Run and Off-The-Run securities. As the purchases were conducted via competitive auction, the Fed purchased the securities that appeared to be cheaper accordingly to its internal pricing model.

⁴ The LSAP also purchased around \$35 billion of TIPS securities which were not included in this study

FIGURE 2 – CUMULATIVE FED PURCHASES OF ON-THE-RUN AND OFF-THE-RUN SECURITIES



IV. METHODOLOGY

As shown before in Figure 1, the financial crisis had diverse impacts on the relative valuation of treasury bonds. While for some maturities On-The-Run bonds became more expensive, for others they became cheaper, which could be a result of institutional preferences for particular maturities and the effects of the financial crisis on their investment decisions and balance sheets.

However, if the Federal Reserve's actions were large enough to impact the market, it should have an effect of reducing those mispricings. In order to test this hypothesis, we will test the following model:

$$\Delta \text{YTM} = a_0 + a_1 \Delta \text{COUPON} + a_2 \Delta \text{DURATION} + a_3 \text{QE PURCHASES} + a_4 \text{QE INTENSITY}$$

Where:

$$\Delta \text{YTM} = \text{YTM}^{\text{OFR}} - \text{YTM}^{\text{OTR}}$$

$\Delta \text{COUPON} = \text{COUPON}^{\text{OFR}} - \text{COUPON}^{\text{OTR}}$, where $\text{COUPON}^{\text{OFR}}$ is the linear interpolation of the coupon of neighboring off-the-run securities as explained above

$\Delta \text{DURATION} = \text{DURATION}^{\text{OFR}} - \text{DURATION}^{\text{OTR}}$, where $\text{DURATION}^{\text{OFR}}$ is the linear interpolation of the coupon of neighboring off-the-run securities as explained above

$\text{QE PURCHASES} = 30\text{d rolling average of Federal Reserve daily treasury purchases}$

$\text{QE INTENSITY} = \text{Difference between the current 14d rolling average of Fed's daily treasury purchases and the previous 14d rolling average (D-14 to D-27)}$.

V. RESULTS

The regression results can be seen below:

TABLE 2 – REGRESSION RESULTS (VALUES IN BPS)

Maturity	Constant	Δ Coupon	Δ Duration	QE Purchases	QE Intensity	R ²	Durbin- Watson
2 year	-0.232	1.306	171.321 (**)	0.513 (**)	-0.084	0.129	0.068
3 year	-0.885 (***)	0.195	32.528 (*)	0.220 (*)	0.229	0.218	0.108
5 year	-1.330 (***)	0.208	16.666 (*)	0.418 (***)	0.073	0.240	0.047
10 year	10.315 (**)	4.137	21.140	-3.184 (***)	0.807	0.167	0.011

(*) – significant at the 0.05 level, (**) significant at the 0.01 level, (***) significant at the 0.001 level

We can see that the estimated constant of the regression was negative for the 2, 3 and 5-year notes and positive for the 10-year bond. The constant can be understood as the average OFR-OTR spread after accounting for the other variables and, as show in Figure 1, the spread was negative for short-term securities during the financial crisis.

The Δ *Coupon* coefficient is not statistically significant for any maturities. The difference in coupons across securities results in different durations, and therefore its impact on the yield is already captured on the Δ *Duration* coefficient.

The Δ *Duration* coefficient is positive for all maturities. This is coherent with an upward sloping yield curve. If the OFR securities have higher durations than their OTR equivalents, they should command a higher yield and therefore increase the OFR-OTR spread.

It can also be seen that the *QE Purchases* coefficient is statistically significant than zero for all maturities. This should be evidence that the Federal Reserve purchases had some impact on the pricing of treasury securities in this period.

The *QE Purchases* coefficient is positive for the 2, 3 and 5-year notes but negative for the 10-year bond. As showed in Figure 1, in the height of the Financial Crisis the OFR-OTR spread became negative for the short-term notes, which would mean that On-The-Run bonds were cheaper to buy than their off-the-run equivalents. The positive coefficient for the *QE Purchases* variable should mean that the Federal Reserve purchases acted to increase this spread. Moreover, the spread for 10-year bonds was highly positive after the financial crisis, and thus the Federal Reserve should have preferred to purchase the cheaper off-the-run bonds instead.

The table below confirms those results and shows that the Federal Reserve practically did not purchase on-the-run 10-year notes during its LSAP programs.

TABLE 3 - TOTAL PURCHASES OF OTR AND OFR SECURITIES

	OTR	OFR	% OTR
2 year	13.25	64.86	17%
3 year	98.76	144.01	41%
5 year	67.20	216.34	24%
10 year	1.00	244.01	0%

However, the *QE Intensity* coefficient is not statistically different from zero. This could be some evidence that periods when the Federal Reserve increased its pace of purchases did not have a significant impact on the spread when compared to the periods

before. Therefore, the impact of the QE program on the mispricing of securities could be mostly caused by the improved liquidity conditions in the market, which allowed market participants to exploit any relative mispricing between treasury securities, instead of just the direct impact of the Federal Reserve bidding up the price of the “cheap” securities. In order to test this hypothesis, we will build the following model:

$$\Delta \Delta \text{YTM} = a_0 + a_1 \Delta \text{TOTAL QE PURCHASES} + a_4 \text{QE INTENSITY} + \Delta \text{S\&P 500}$$

Where,

$\Delta \Delta \text{YTM}$ = Weekly difference of the OFR-OTR spread. (Current OFR-OTR spread minus the spread in the previous week)

$\Delta \text{TOTAL QE PURCHASES}$ = Amount purchased in the current week

QE INTENSITY = Amount purchased in the current week minus the amount purchases in the previous week (first-difference of $\Delta \text{TOTAL QE PURCHASES}$)

$\Delta \text{S\&P 500}$ = Weekly return of the S&P 500

The results are as follows:

	$\Delta \text{TOTAL QE PURCHASES}$	QE INTENSITY	$\Delta \text{S\&P 500}$	R^2
2 year	0.00	0.04	-12.38 (***)	0.05
3 year	0.00	-0.05	-8.78 (**)	0.03

5 year	0.00	0.00	-6.6 (*)	0.01
10 year	-0.01	-0.06	-14.17 (**)	0.03

As can be seen in the table above, when analyzing the weekly differences in the OFR-OTR spread, the amount of securities purchased under QE has no statistically significant impact, although there appear to be some impact from the market returns. This supports the argument that the most of the impact of QE on the OFR-OTR was indirect, as the Federal Reserve actions improved market confidence and liquidity conditions. To further test this argument, the next section will compare the impact of the QE2 to QE1. As market conditions had already improved markedly during the second quantitative easing program, the impact of QE2 on the OFR-OTR spread should be reduced when compared to QE1.

VI. DIFFERENCES BETWEEN QE1 AND QE2

The second time the Federal Reserve engaged in its treasury purchases program, conditions were very different. Liquidity conditions were greatly improved and the spread between on-the-run and off-the-run securities was much reduced. Therefore, one should expect the impact of QE2 to be reduced when compared to QE1. In order to test this hypothesis, we are going to run the model in two different time periods in order to analyze the changes in the coefficients. The first period is going to be from January/2008 to December/2009 and is going to take into account the Financial Crisis and QE1. The

second period is going to be from January/2010 to November/2011 and is going to take into account the reinvestment of coupon and principal payments and QE2.

TABLE 4 - QE PURCHASES ESTIMATED COEFFICIENT IN TWO PERIODS

	QE Purchases Coefficient	
	2008-2009	2010-2011
2 year	3.818 (***)	-0.867 (***)
3 year	0.255	0.390 (**)
5 year	2.463 (***)	-0.117
10 year	-1.548	-0.566

(*) – significant at the 0.05 level, (**) significant at the 0.01 level, (***) significant at the 0.001 level

It can be seen from the table above that, with the exception of the 3-year note, the impact of QE2 was much lower than QE1. Moreover, while during QE1 the direction of this impact was different between short-term and long-term securities, during QE2 this impact was for the most case to reduce the OFR-OTR spread.

Those results are coherent with the ones obtained for the previous regressions. First of all, during QE2, the OFR-OTR spread (after accounting for differences in coupon and duration) was positive for most maturities. Therefore, off-the-run securities were seen as cheap and the Fed’s purchases worked to reduce their spread relative to on-the-run securities. Second, market conditions were markedly better during QE2, which meant that market participants were more able to exploit mispricings than during QE1.

Therefore, the indirect impact of the second program of purchases would be reduced when compared to the first one.

VII. CONCLUSIONS

This paper analyzed whether the Federal Reserve LSAP program had a significant impact on the relative pricing of treasury securities. This was estimated as the difference between the YTM of On-The-Run and Off-The-Run bonds of same maturity. After the beginning of the financial crisis, this spread moved significantly, which could be explained by liquidity differences, repo rates or other effects as in (Longstaff, 2002).

By engaging in Large-Scale Asset Purchases, also known as Quantitative Easing, the Federal Reserve purchased over \$900 billion of treasury securities between March/2009 and June/2011. Those purchases were conducted under competitive bidding, which meant that the Fed purchased the securities that it considered “cheap” at a given price accordingly to its internal valuation model.

By regressing the value of the spread against the amount of treasury securities purchased in a given period, it is possible to assess whether the Fed purchases had a significant impact on the mispricing of securities in the yield curve. The results show that the purchases had positive impact on the spread for 2, 3 and 5 year notes and a negative impact for 10 year bonds. This impact can be understood as a “direct” effect, caused by the Fed purchases bidding up the prices of treasury bonds and as an “indirect” effect, caused by the improved market conditions made possible by the quantitative easing

program. By testing the effect of the Federal Reserve purchases on the change of the OFR-OTR spread of securities, there is significant evidence that the “indirect” effect was relevant while the “direct” effect was negligible. Moreover, the results change markedly from the first quantitative easing program to the second, which could be further evidence that any impact was relevant mostly because dealers and other market participants suffered balance sheet constraints that prohibited them from engaging into arbitrage opportunities. During the 2008-2009 period, the average impact of the Fed purchases was on the order of 2bps for each \$1 billion of average daily treasury securities purchased. Therefore, on the height of the QE1 program, when the daily treasury purchases averaged \$2.5 billion during May/2009, this could have mean that On-The-Run short-term notes were 5-6 bps more expensive than otherwise.

During the 2009-2010 period, although the amount of securities purchased increased markedly, the impact of the purchases was reduced as market conditions have improved. Therefore, although the average daily purchases reached \$5 billion during February/2011, it had an estimated impact of making Off-the-Run 10-year securities just 2-3 bps more expensive than otherwise.

Although those results show that there was clearly some impact of the Federal Reserve purchases on the relative pricing of Treasury securities, the impact is not high enough to justify a trading opportunity. Although during rough market conditions the implementation of a quantitative easing program could cause the OFR-OTR spread to change by 5-6bps, the same rough market conditions would mean that market volatility

and balance sheet constraints would be more pronounced. In those market conditions, a 5bps spread is probably not a high enough return to justify the increased risk.

The Federal Reserve LSAP program was an unprecedented intervention on the US Treasury Market and as such can provide the ground for different areas of research. This paper tried to analyze the impact of this program by analyzing its impact on the OFR-OTR spread, but there are different approaches for this problem that could lead to interesting areas of research. First of all, one could extend this study by looking at the individual securities purchased instead of an aggregate amount as was done in this paper. Moreover, similar to the work done in (Christensen & Gillan, 2012), one could use an event-study approach to analyze the impact of the Fed auctions themselves and their announcements on the spread.

Also, part of the hypothesis of this paper rested on the assumption that the Federal Reserve used a spline similar to the one described in (Waggoner, 1997) to choose which securities to purchase. By fitting different splines and comparing them to the actual securities purchased in the QE program, one could try to estimate which parameters the Fed uses when assessing the price of treasury securities.

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