TWO ESSAYS IN FINANCE

By

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To my loving wife Tracy and to my wonderful parents
Your love and support has not gone unnoticed

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In this study, I look at two very distinct topics in finance. The first part of the study examines the impact of market-wide uncertainty on corporate payout policy. While the prior literature has mostly focused on internal, firm-level determinants of payout policy, I show that market-wide economic uncertainty (as proxied for by the VIX) also plays a significant role in the payout policy decision. By utilizing interaction variables for each of the volatility measures, I am able to demonstrate that the impact of both internal and external volatility measures depends upon the firm's level of cash flow. Firms with relatively low cash flow are significantly more likely to cut dividends when market-level volatility is higher than are firms with relatively high cash flow. With regards to the decision to repurchase stocks, I show that high cash flow firms become opportunistic during highly volatile markets and are more likely to initiate a repurchase. Companies with high firm return volatility tend to cut back on repurchases. I also demonstrate that tax changes, such as dividend tax rate changes and repatriation tax cuts, have an impact on payout policy.

In the second part of the study, I examine the changes that have occurred in extended-hours trading since non-institutional traders were first given access in 1999.

Using a large sample of extended-hours trades from 1999 through 2009, I find that the trends identified in regular trading hours do not necessarily transfer to the extended-hours trading sessions. I also utilize both the Weighted Price Contribution measure as well as a newly created measure, Absolute Price Discovery, to examine changes in the portion of daily price discovery that occurs outside of regular trading hours over time. I show that extended-hours trading has become significantly more important to the price discovery process over my sample period. For S&P 1500 Composite Index firms the percentage of price discovery occurring during extended-hours trading has risen from 5.71% in 1999 to 25.28% in 2009. For the larger stocks that comprise the S&P 500 Index this growth is even more dramatic, from 6.05% in 1999 to 41.09% in 2009.

CHAPTER 1
INTRODUCTION

In the two chapters that constitute this study, I examine two very distinct topics in the field of finance: payout policy and extended-hours trading. The first part of the study, Chapter 2, investigates the impact market-level uncertainty has on a firm's payout policy decision. While much of the prior literature on the determinants of payout policy focuses on internal, firm-level factors, I show that external factors can also have descriptive power on the payout choice of firms even after controlling for firm-level characteristics. Using the Chicago Board Options Exchange Volatility Index (VIX) as a proxy for market-level uncertainty, I demonstrate that firms with low levels of cash flow become more conservative with their payout policy as indicated by an increasing propensity to halt dividend increases, or even decrease or eliminate their dividend altogether. With regards to repurchases, I show that firms with high levels of cash flow become opportunistic by increasing the likelihood of initiating a share repurchase.

In the second part of the study, Chapter 3, I shift the focus to extended-hours trading. I examine the trends that have occurred since the introduction of non-institutional investors to the after-hours trading environment in 1999. As the United States financial market becomes increasingly intertwined with the global market and as information flows across the 24-hour day become more seamless, I demonstrate that the importance of extended-hours trading on the price discovery process has increased significantly.

Overview of Chapter 2

The prior literature on the determinants of payout policy has focused almost entirely on internal firm characteristics. In Chapter 2 I demonstrate that external, market-level factors can also impact the decision of a firm with regards to dividend payment or share repurchases. Using the VIX as a proxy for market-level uncertainty I find the differing affect on the payout policy decision (both dividends and repurchases) dependent on the firm's relative cash-flow levels. Even after controlling for a wide range of previously utilized firm-level determinants of payout policy, I show that the VIX has a significant impact.

Lintner's (1956) "dividend stickiness" theory argues that firms are reluctant to reduce dividend payout levels due to the perceived negative signal and resulting stock price decrease that is associated with a dividend decrease. I show that firms with relatively low levels of cash flow choose to become conservative in their approach to cash holdings when market-level uncertainty is high. They become less likely to increase their dividend over pre-established levels and have an increased probability of decreasing or even eliminating their dividend. Firms with relatively high levels of cash flow are better suited to withstand these times of market volatility. While they do still become somewhat more conservative, as evidenced by a decreased likelihood of a dividend increase, they do not become significantly more likely to decrease or eliminate their dividend when market wide volatility is high.

Given that changes in the level of stock repurchase are not viewed by investors or firms as the same type of long-term commitment as dividend changes, I show a very different impact of market-level volatility on the repurchase decision. Firms with high levels of cash flow are actually more likely to initiate a repurchase during high VIX periods. This result likely represents these firms utilizing periods of high volatility to opportunistically repurchase shares at a low level. The firm may be able to identify periods of underpricing for their shares due to the high volatility or may time repurchases for periods where investors require high market risk premiums therefore resulting in temporarily low stock prices. Firms with relatively low levels of cash flow, on the other hand, are not significantly affected by the uncertainty in terms of the repurchase decision. This may reflect a lack of cash flow to repurchase opportunistically.

Overview of Chapter 3

Extended-hours trading refers to trading that occurs outside of the normal 9:30 am to 4:00 pm trading day. Non-institutional traders were first given access to trade during the extended-hours in 1999. In Chapter 3 I examine the general trends in extended-hours trading since 1999 with specific attention being paid to the price discovery process. I show that the trend towards a larger volume of smaller trades documented by Chordia, Roll and Subrahmanyam (2011) during regular trading hours does not necessarily transfer to extended-hours trading. While the volume of trading occurring outside of trading hours has grown over time, the size of the trades has not shown a significant drop over an extended period as has been seen in regular trading hours.

Using both the previously established Weighted Price Contribution (WPC) measure of Barclay and Hendershott (2003) and my own newly created Absolute Price Discovery (APD) measure, I demonstrate that a significant portion of the 24-hour price discovery process has shifted from regular trading hours for U.S. stock exchanges and is now occurring before 9:30 am and after 4:00 pm. The percentage of price discovery occurring outside of trading hours has steadily increased from approximately 8.49% in 1999 to approximately 32.35% in 2009 using the WPC for the S&P 1500 Composite

Index. Utilizing the APD, a newly created variable that adjusts for a potential upward bias in the WPC, the percentage of price discovery taking place in extended-hours trading still increased from 5.71% in 1999 to 25.28% in 2009. This increase in price discovery over time is even more dramatic for larger, more heavily trade stocks. Breaking the sample down to only the S&P 500 large-cap stocks reveals an increase in WPC from 10.11% in 1999 to 57.52% in 2009. The increase using the APD measure is from 6.05% to 41.09%.

This shift in the price discovery process represents changes in the United States financial market as it becomes more dependent on changes in the global economy and as information flow through the day becomes easier and more continuous. Though extended-hours trading has been a mostly ignored area in the academic finance literature, I believe that this study demonstrates its growing importance. Given the significant growth in price discovery outside of trading hours it is clearly not of marginal importance. In future extensions I plan to continue to fill the gap in the literature regarding extended-hours trading.

CHAPTER 2
THE EFFECTS OF UNCERTAINTY AND TAXES ON CORPORATE PAYOUT POLICY

Should firms pay out a portion of their earnings in the form of dividends? If so, what percentage of earnings should be paid out and how should this level be determined? While a significant portion of the financial payout policy literature has debated the "dividend puzzle," as articulated by Black (1976) which questions why firms pay dividends when they appear to be tax disadvantaged, another large portion has simply accepted the fact that a significant number of firms do pay dividends and have attempted to show the determinants that affect the dividend decision for firms.[1] In general these studies have utilized firm-level attributes to demonstrate the types of firms that pay dividends and the characteristics that may lead to changes in dividend policy.

One such study is Fama and French (2001) who argue that dividends are disappearing over the period 1963 to 1998. The authors show that the percentage of firms paying dividends decreased from a high of nearly two out of every three firms (66.5%) in 1978 to approximately one in five firms (20.8%) in 1999.[2] Fama and French (2001) try to explain the disappearance of dividends due to the changing composition of publicly traded firm types. In general large firms with more steady earnings are significantly more likely to pay dividends than their smaller, more volatile counterparts. As the composition of publicly traded firms shifted towards more small, growth-oriented

[1] Fischer Black coined the phrase "dividend puzzle" in his 1976 paper entitled simply "The Dividend Puzzle." In this paper, Black considered arguments described in prior literature, specifically Miller and Modigliani (1961), which set forth a model in which dividends were irrelevant given an efficient market with no transaction costs, no bankruptcy costs and no asymmetric information.

[2] DeAngelo, DeAngelo and Skinner (2004) show that, while the number of dividend payers did decrease, the aggregate level of real dividends paid by industrial firms actually increased over this time. This is due to the high percentage of total dividends being paid out by the largest dividend-paying firms and the relative small amount of dividends that were being paid by the firms which reduced or eliminated dividends.

firms near the end of the Twentieth Century it was logical that there would be a decrease in the proportion of firms paying steady dividends. However, Fama and French (2001), even after accounting for these firm-level attributes, still find that the likelihood of a firm paying out dividends decreased during this time period. While Fama and French (2001) focus on firm-level attributes, they do not account for factors external to the firm when explaining dividend choice. Baker and Wurgler (2004) explore this possibility by looking at the potential impact that external factors could have on payout policy. According to their Catering Theory, the premium that investors assign to dividend-paying firms changes over time. These shifts in dividend premiums can be affected by a variety of factors including changes in tax rates and changes in investor sentiment levels. The Catering Theory would imply that, as the value investors place on the payment of dividends shifts over time, firms are willing to shift their payout policy to "cater" to investor's preferences.[3] Though Baker and Wurgler (2004) find that their estimated dividend premium does influence firms' propensity to initiate dividends during their sample period, they do not find that the dividend premium has a significant impact on the propensity to continue dividends for firms which have already paid a dividend in the prior fiscal year.

Chay and Suh (2009) examine the impact of firm-level uncertainty as a determinant of payout policy. Prior survey evidence (such as Brav et al (2005)) argues that a firm's level of cash-flow uncertainty plays a large part in the decision of whether or not to change the dividend level, though the exact operational definition of this

[3] The Catering Theory can be viewed as an extension of the Miller-Modigliani (1961) notion of dividend clienteles in a world with market frictions that can slow the adjustment of the supply of dividends to the demand for them.

uncertainty is not surveyed. Chay and Suh (2009) confirm this empirically. Using monthly stock return volatility as a proxy, they show that a firm's stock return volatility is a strong determinant of its payout policy. This finding ties in well with the dividend stickiness theory of Lintner (1956) which argues that firms are hesitant to make major changes in dividend policy to avoid the stock price penalty that is associated with decreasing or eliminating their dividend.

Similar to Chay and Suh (2009), Hoberg and Prabhala (2009) look at how uncertainty affects the payout decision. However, Hoberg and Prabhala (2009) use idiosyncratic risk and firm-level systematic risk as their measures of uncertainty. This allows them to not only capture the firm's diversifiable risk, but also the non-diversifiable risk. After including their risk factors, Hoberg and Prabhala (2009) show that the dividend premium from Baker and Wurgler (2004) is no longer significant, which leads them to question the importance of the Catering Theory.

In this paper I build on the framework set-up by Fama and French (2001), Baker and Wurgler (2004), Chay and Suh (2009) and Hoberg and Prabhala (2009). I show that another significant determinant of a firm's payout policy choice is market-wide uncertainty that is external to the firm as defined by the popular risk measure, the Chicago Board Options Exchange Volatility Index (VIX); the implied volatility from options on the S&P 500. While Baker and Wurgler (2004) begin to touch on the fact that external, non-firm-specific factors may have an impact on the payout policy of firms, they do not fully explore what these factors may be, such as the VIX. On the other hand, Chay and Suh (2009) and Hoberg and Prabhala (2009) show that uncertainty plays a role in the payout decision, but only examine individual firm volatility.[4] I bridge this gap and show that external, market-level uncertainty is actually a significant factor when a firm is making its payout policy decisions. When market conditions become less stable all firms are likely to become less confident in their ability to maintain an appropriate level of free cash to sustain current dividend levels. Therefore dividend paying firms become more likely to decrease/eliminate dividends and conserve cash. At the same time non-dividend paying firms are less likely to initiate dividends during volatile market-wide economic conditions. On the other hand, when the market-wide volatility is lower, even firms with relatively high internal cash flow uncertainty may feel more comfortable initiating a low level of dividends. Figure 2-1 compares the percentage of firms decreasing/eliminating dividend levels relative to the percentage of firms increasing dividend levels over time. It becomes quite apparent that firms have been more likely to decrease/eliminate during highly uncertain market conditions (near the bursting of the technology bubble in the early 2000s and again during the subprime mortgage crisis around 2007 to 2009). Whether this is driven by declines in profitability or reactions to extreme market uncertainty is an empirical question.

The recent market instability associated with the subprime mortgage crisis is a very good example of the effect market conditions can have on payout policy. As credit becomes less available to firms and earnings begin to fall dividends become less attractive to firms, particularly if there is heightened uncertainty about the future. This

[4] Hoberg and Prabhala (2009) do examine firm idiosyncratic risk and systematic risk from a market model. Their systematic risk component, however, has a “firm specific” component (the beta of the stock), is not forward-looking like the VIX and arguably the VIX may capture other elements of the market “fear” of uncertainty. In fact, the VIX is often viewed as a measure of market fear. See, for example, Whaley (2000) and Arak and Mijid (2006) for further details on the VIX and its commonly-used nickname the “fear gauge” or “fear index.”

can be seen clearly in the press releases issued at the time of dividend announcements over the past few years. Below is a small sampling of quotes from press releases during the subprime mortgage crisis:

- International Paper Company: Decreased dividend from 25 cents per share to 2.5 cents per share
    - Direct quote from Chairman and CEO John Faraci: “While our cash balances and cash flows remain solid, we believe it is prudent to manage cash conservatively in this uncertain economic environment.” (Reuters)
- Entercom Communications Corp: Eliminated prior dividend of 10 cents per share after having already decreased the dividend from 38 cents per share in a prior quarter
    - “…has suspended the Company’s dividend in light of the difficult business environment and the uncertain outlook for the U.S. economy.” (Business Wire)
- Dover Motorsports: Decreased dividend from 1.5 cents per share to 1 cent per share and later eliminated their dividend in a subsequent quarter
    - “The company believes that adjusting the dividend is prudent given the current economic environment and will afford it greater financial flexibility moving forward.” (Business Wire)
- Kenneth Cole: Eliminated prior dividend of 9 cents per share after having already decreased the dividend from 18 cents per share in a prior quarter
    - “The company said it is suspending its 9 cent dividend to ‘preserve and manage liquidity in a highly uncertain environment.’” (Associated Press)
- JP Morgan Chase & Co: Decreased dividend from 38 cents per share to 5 cents per share
    - “Extraordinary times call for extraordinary measures.” (Dow Jones News Service)

To account for the impact of market-level economic conditions I utilize the Chicago Board Options Exchange Volatility Index (VIX) as a proxy for market-level volatility and uncertainty. The VIX measures implied volatility on the S&P 500 index options and is often referred to as the “fear index” for the general market.[5] I show that the VIX adds power to tests of the probability of a firm changing their dividend policy even in the presence of other uncertainty measures such as firm stock return volatility. In addition to the VIX I also introduce a measure of analyst dispersion as another volatility variable for the payout choice. Dispersion of analyst opinion captures the uncertainty of the market regarding the firm’s future earnings taking into account both firm-level and market-level factors. It is a strong forward-looking measure and thus is potentially important to include in tests of payout choices. I show that firms are significantly more (less) likely to decrease or eliminate (increase or initiate) their dividends when analyst dispersion is high (low).

Another contribution of this study is that I show how firms in different relative cash flow positions react differently to both firm-level stock volatility and market-wide volatility. In general, firms with low relative cash flow become more sensitive to external uncertainty while firms with high relative cash flow are not as severely affected. I also utilize two measures of tax rate changes as control variables from the prior payout literature. I include a variable that measures the change in the dividend tax rate. This variable allows my model to capture the effect of dividend tax rate changes on dividend policy. The prior literature, such as Chetty and Saez (2005), shows that large dividend tax changes can have a significant impact on payout policy.[6] The second tax rate variable captures the effect of repatriation tax cuts for firms that have positive foreign

[5] See Whaley (2000) and Arak and Mijid (2006) for further details about the VIX and why it is commonly referred to as the “fear gauge” or “fear index.”

[6] Brav, et al (2008) survey 328 financial executives and demonstrate that, while not the most important factor in the payout policy decision, the 2003 dividend tax cut did play a significant role in the decision by many firms to initiate or increase dividends.

income. Blouin and Krull (2009) demonstrate that "repatriating firms increase repurchases significantly more than nonrepatriating firms in 2005" in response to the American Job Creation Act. Therefore it seems sensible to believe that it may have some impact on dividend policy as well. When combined with control variables from prior research (size, market-to-book, profitability and growth rate of assets from Fama and French (2001) and cash-flow volatility from Chay and Suh (2009)), the VIX, analyst dispersion and tax rate measures help create a much more powerful test of dividend policy choice.

Since Skinner (2008) shows that firms are increasingly using repurchases both as a complement and a substitute to dividends, each test conducted for dividends is replicated for the choice to repurchase and the decision to change repurchasing levels. Again, it is worthwhile to also look at the impact that internal and external volatility, their interaction with relative cash flow levels, and the taxation variables have on the repurchase choice. In general, firms with high internal volatility show mixed results, but appear to be more reluctant to conduct or initiate share repurchases, particularly at higher cash flow levels. It also appears that firms with high cash flow levels are more likely to initiate or conduct repurchases when market uncertainty (VIX) is high. This may be evidence of opportunistic behavior by high cash flow firms. Additionally, evidence tends to show that firms more freely switch their repurchasing level to match their internal earnings, cash flow, volatility, etc. This is consistent with prior literature and beliefs that repurchases are much less "sticky" than dividends and repurchase levels are more freely switched than are dividend levels.[7] Furthermore, firms that are

[7] Brav, et al (2005) show in survey evidence that firms are more likely to use new free cash flow for repurchases than dividends due to the "sticky" nature of dividends discussed in Lintner (1956)

likely to bring back cash due to repatriation taxes are more likely to increase repurchases, consistent with them potentially viewing such an event as a one-time change that is more conducive to doing a repurchase rather than committing to a higher dividend level.

Given the fact that my original sample only looks at 1990 to 2009 due to the VIX measure only being available post 1990, there is concern that my results may be overly influenced by the high VIX period which occurred during the recent financial crisis. To ensure that the results are robust to both a longer sample period and to removing the recent crisis, I construct a generalized autoregressive conditional heteroskedasticity (GARCH) model to estimate market volatiltiy back to 1962. This GARCH estimate has a correlation of 0.913 with the VIX through the overlapping period of 1990 to 2009. I then replace the VIX measure with the GARCH measure and rerun all tests in this study. I find that the main results hold in both the full sample (1962 to 2009) and the non-overlapping sample (1962 to 1989). This demonstrates that the results are not caused solely by the high VIX period of the financial crisis.

Data

Sample Creation

The data set used in this study is for the period 1990 to 2009. The initial sample is calculated in a manner very similar to Fama and French (2001). I started with the universe of firms covered by Compustat and eliminated all utilities (firms with Standard Industrial Classification (SIC) Codes between 4900 and 4949) and financial firms (firms with SIC Codes between 6000 and 6999). Firms were required to have book equity (defined as stockholder's equity (Compustat Item #216) minus preferred stock (Compustat Item #10) plus deferred taxes and investment tax credits (Compustat Item

#35) plus post retirement assets (Compustat Item #15)) greater than $250,000 and total assets (Compustat Item #6) greater than $500,000 to be included in the sample.

All firms in the sample were also required to have non-missing values for common shares outstanding (Compustat Item #25), total assets (Compustat Item #6), price close – fiscal (Compustat Item #24), income before extraordinary items (Compustat Item #18), dividends per share – ex date – fiscal (Compustat Item #26), interest and related expense (Compustat Item #15), preferred dividends (Compustat Item #19), and earnings before interest taxes, depreciation and amortization.

To be included in the sample firms must also have either (a) stockholder's equity (Compustat Item #216), (b) common equity (Compustat Item #60) and preferred stock (Compustat Item #130), or (c) total liabilities (Compustat Item #118) as well as either (a)preferred stock / liquidating value (Compustat Item #10), (b) preferred stock / redemption value (Compustat Item #56), or (c) preferred stock (Compustat Item #130). I obtained Standard Industrial Classification (SIC) Codes from CRSP as well as share code data. To remain in the sample firms must have share codes of either 10 or 11 to ensure that they are publicly traded.

Dependent Variables

In this study I look at the payout choice in three different specifications. The first specification is simply the choice to either pay or not to pay a dividend. The second specification is the choice to increase, decrease or maintain current dividend levels, given that the firm paid a dividend in the prior fiscal year. The final specification I utilize is the choice to maintain no dividend or initiate a dividend given that the firm did not pay a dividend in the prior fiscal year. This same set of specifications is also utilized replacing dividends with repurchases.

For the first specification style, a firm is considered to be a payer if the ex-date dividend per share (Compustat Item #26) is positive. Similarly, when utilizing the first specification for repurchases, a firm is considered to be a repurchaser if total repurchases are positive. Repurchases are defined similarly to Grullon and Michaely (2002) as purchase of common and preferred stock (Compustat Item #115) minus any reduction in the redemption value of preferred stock (Compustat Item #56).[8] Banyi, Dyl and Kahle (2008) show that this measure is the most accurate of the commonly utilized repurchase definitions.

For the second specification I look at the choice set for firms that have paid a dividend in the prior fiscal year. I utilize a one fiscal year lagged value of the payer term used in the first specification to identify firms that paid a dividend in the prior fiscal year. A firm is considered to have decreased (increased) their dividend level if the dividend per share for the current fiscal year has decreased (increased) more than 5% relative to the prior fiscal year. If the dividend per share stays within 5% of the initial dividend per share level of the prior fiscal year then the firm is considered to have maintained their prior dividend policy. The same definitions are utilized for repurchases, except replacing dividends per share with the repurchase definition (as stated in prior paragraph) and replacing 5% with 20%. The wider range for the definitions of increasing/decreasing on repurchasing is utilized because firms' repurchase policies are generally less stable than dividend policies. By utilizing a wider range I am better able to identify the characteristics that result in a significant change in policy.

[8] Reductions in the redemption value are required to be non-negative. Therefore, reduction in the redemption value of preferred stock (defined as Compustat Item #56 minus the one fiscal year lagged value of Compustat Item #56) is truncated at 0.

The final specification considers firms which did not pay a dividend in the prior fiscal year. If the dividend per share for the current fiscal year is positive then the firm is considered to have initiated a dividend. If not, the firm is considered to have maintained the prior payout policy to not pay a dividend. Each of the three specifications is also conducted for the repurchase choice. In these specifications dividend per share is replaced with net repurchases.

Explanatory Variables

The explanatory variables utilized in my regressions can be grouped into four specific categories: (1) Fama and French (2001) variables, (2) internal and external volatility measures, (3) tax measures, and (4) additional firm-level controls.

Fama and French (2001) variables. The subset of Fama and French (2001) variables consists of the four variables primarily utilized in the Fama and French (2001) study. These four variables are chosen as a base for the regressions as they are commonly accepted explanatory variables for the payout choice.

The first variable in this category is *NYP* which is defined as the percentage of firms on the New York Stock Exchange with the same or lower market capitalization relative to the firm's market capitalization for the current fiscal year. This is calculated in 5% intervals.[9] *NYP* captures the size effect as larger, more established firms are generally more likely to pay dividends.

The next variable in the Fama and French (2001) subset of explanatory variables is *MtoB* which represents the firm's market-to-book ratio for the current fiscal year. The

[9] For example, if firm XYZ has a market capitalization in fiscal year t which is equal to or less than the cutoff for the bottom 5% of the NYSE market capitalizations than the corresponding value of NYP for firm XYZ in fiscal year t is 0.05.

market-to-book ratio is defined as (total assets (Compustat Item #6) minus book value plus market equity) divided by total assets. Book value is defined as stockholder's equity (Compustat Item #216) minus preferred stock (Compustat Item #10) plus deferred taxes and investment tax credits (Compustat Item #35) plus post retirement assets (Compustat Item #15). Market equity is defined as the stock's closing price (Compustat Item #24) multiplied by the number of common shares outstanding (Compustat Item #25). Fama and French (2001) utilize *MtoB* as one measure to identify investment opportunities.

The third Fama and French (2001) variable is *dA/A* which represents the change in assets (lag total assets – total assets) divided by lag total assets. As with *MtoB*, *dA/A* is used to identify investment opportunities. In both cases, we should expect higher investment opportunities to correlate with decreased probability of dividend payment.

The final variable from Fama and French (2001) is *E/A* which is defined as (income before extraordinary items (Compustat Item #18) plus interest and related expenses (Compustat Item #15) plus deferred incomes taxes (Compustat Item #50)) divided by total assets. A higher level of earnings allows for more opportunity to pay dividends to investors.

Internal and external volatility measures. In this study I aim to empirically show that payout policy is affected by not only internal, firm-level volatility (as shown in Chay and Suh (2009)), but also by external, market-level volatility. For my measure of firm-level volatility I utilize *ReturnVolatility* defined as the annualized monthly standard deviation of stock returns for the 24 month period including the prior fiscal year and the current fiscal year. This definition is similar to Chay and Suh (2009) with the only difference being that I annualize the standard deviation and multiply by 100 to convert from a decimal to percentage. This is done to bring the scaling closer to that of the VIX variable to allow for closer comparison of coefficients. This definition is utilized as a proxy for firm-level cash-flow volatility, despite the fact that it also contains some portion of market-level volatility in it, to remain consistent with prior literature. However, by containing market-level volatility within the proxy for cash-flow volatility I am biasing against my key independent variable *VIX* as some of its power is being absorbed by *ReturnVolatility*. The variable *ReturnVolatility* also has the issue that it can proxy for start-up firms and distressed firms which are less likely to pay dividends and more likely to decrease/eliminate dividends if they had paid them in the prior fiscal year.

My main variable of interest is the variable *VIX* which is defined as the average value of the Chicago Board Options Exchange Volatility Index (VIX) for the first nine months of the firm's fiscal year. The VIX represents the implied volatility of index options of the S&P 500. It is commonly referred to as the market's 'fear index'. Using the VIX in my specifications allows me to measure the impact of market-level volatility as well as the impact of the market's anticipation for the future direction of the market. As indicated by the 'fear index' moniker, the VIX can also be utilized to capture some of the behavioral impact at the market-level. When the VIX increases significantly, it generally indicates that the market has begun a downturn or the market believes tough times are ahead; or a combination of both.

As Lintner (1956) points out, firms are hesitant to make major changes to prior dividend policies. Likewise, as Brav et al (2005) show using survey evidence, firms tend to make dividend decisions using the prior fiscal year's dividend per share as a base. Therefore, it would seem logical that the VIX would have a significant impact on the year-to-year decision of whether or not to change the payout policy (increase, decrease, eliminate, initiate, or maintain). Firms will consider the prior dividend per share level and then make changes relative to this level based upon firm-level and market-level information. A firm is likely to decrease the per share dividend only if current free cash flow and/or future cash levels are threatened due to a change in either internal or external indicators. As a result, large changes in the VIX may be one of the driving factors causing firms with steady dividends to decrease/eliminate their prior dividend per share, or for a firm with a steadily increasing dividend per share over time to cease the increase and maintain the current level.

However, a market-wide indicator such as the VIX should be much less likely to have a major impact as a general indicator of which firms pay dividends verse which firms don't pay. Given this is a relatively stable choice (firms generally either pay over time or don't) it wouldn't be expected that a variable that is not firm-specific would have a significant impact. In fact, the most likely impact the VIX should have on the tests of payers verse non-payers is through increases (decreases) in the number of firms eliminating (initiating) dividends or significantly decreasing (increasing) dividends when the VIX is high, and vice versa for when the VIX is low. Since changes in the pure level of dividends per share will not be caught through tests only dealing with the choice to pay or not to pay, the impact of the VIX should be significantly less important for the choice to pay a dividend.

The final volatility variable utilized is the dispersion of analyst opinion. *AnalystDispersion* is measured as the dispersion of opinion amongst analyst forecasts scaled by the mean monthly price of the firm's stock. For *AnalystDispersion* to be a non-missing value I require a minimum of three analysts to have covered the stock during at least four months of the prior fiscal year. Analyst dispersion is often utilized as a measure of uncertainty about the firm's future outlook. If analysts, (who are generally regarded as one of the most, if not the most, informed investors regarding the stocks they cover) have large disagreements regarding potential future earnings, then it is likely that upper-level management also has the same feeling when looking at future earnings of the firm. Therefore I utilize dispersion as a way to capture firm-level volatility in a forward-looking environment. The prior expectation is that firms that have more volatile outlooks on future earnings should be more likely to have a conservative approach towards dividend policy. This should result in a higher propensity to decrease dividends per share and a lower propensity to increase. Unlike the VIX measure, analyst dispersion is a firm-level characteristic and is likely to be more stable over time (firms with high dispersion of analyst opinion during one fiscal year are more likely to have had high dispersion in prior years) so it should also impact the payer/non-payer choice significantly as well.

However, using analyst dispersion is not without its issues. As Das, Levine and Sivaramakrishnan (1998), Lim (2001) and others have shown, analyst forecasts are subject to their own biases. These biases need to be taken into consideration when evaluating the impact of *AnalystDispersion*. Also, due to the requirements of having at least three analysts covering the stock for at least four months of the fiscal year, *AnalystDispersion* has a significant impact on the size of the sample which can be utilized. This effect is likely to bias the sample towards a higher percentage of dividend paying stocks as large well-established firms which have more analyst coverage and will be more likely to pay dividends. Therefore I run each regression with and without *AnalystDispersion* so as to not affect the interpretation of other variables due to a restricted sample.

For each of the three volatility measures (*ReturnVolatility*, *VIX*, and *AnalystDispersion*) I employ interaction terms allowing the potential to identify the differing impact each measure of volatility has depending on the firm's level of cash flow. This is an important addition to my study and, at least to the extent of my knowledge, is the first time this approach has been utilized in the payout policy literature. It may be the case that internal, firm-level volatility or external, market-level volatility impacts a firm's payout decision differently if they have relatively low cash flow than it would if they currently had a relatively high level of cash flow. The three volatility measures are interacted with cash flow quartiles which are dummy variables that place each firm into a quartile based upon its relative level of cash flow for the current fiscal year. The cash flow variable used for the quartiles is defined as cash flow divided by total assets where cash flow is measured as earnings before interest, taxes and depreciation (EBITDA in Compustat). Quartile 1 represents the 25% of firms with the lowest levels of cash flow over assets and Quartile 4 represents the 25% of firms with the highest levels of cash flow over assets.

The prior expectation is that the level of cash-flow will have a significant impact on the effect of the external, market-level volatility measure *VIX*. The intuition for this expectation is that firms that are doing relatively well during a tough market may make minor adjustments to payout policy (such as simply maintaining their dividend per share instead of giving a slight increase) as a reaction to the tough economic environment, but are much less likely to make major changes (such as decreasing or eliminating their dividend per share) than firms that are being hit relatively hard by the poor market. In fact, it may be that firms in the upper quartile of cash flow during high VIX periods actually go as far as to take advantage of the market downturn and increase dividends or repurchases during these tough economic periods. Similar to the Catering Theory argument made by Baker and Wurgler (2004), this would imply that firms are looking for times in which they can take advantage of their relative strong position as a chance to cater to investor preferences for dividends during tight markets. Firms that would be likely to fall in to this category would be firms with high cash flow levels and more stable earnings.

For the firm-level volatility measures (*ReturnVolatilit*y and *AnalystDispersion*) the prior expectation is that there should be no significant difference between firms with relatively low cash flow and relatively high cash flow for the current fiscal year. If these firms are concerned about avoiding constant changes to the dividend level (as Brav et al (2005) show most firms generally are), then firms with high volatility should not be eager to increase or initiate dividends just because they have one fiscal year with high earnings. Instead they should be concerned that, due to their high volatility of earnings, they may be forced to turn around the next fiscal year and pay the penalty of decreasing/eliminating this newly established dividend level and should therefore avoid the change altogether. However, it could be that firms with high internal volatility are less sensitive to the “dividend stickiness” argument of Lintner (1956) and therefore frequently adjust dividend per share levels, and even potentially whether they pay a dividend or not, to fit their current cash flow levels. If this were the case, the results should indicate that firms in cash flow quartile 4 specifically, and possibly those in cash flow quartile 3 as well, should be more (less) likely to increase (decrease) their dividends even if they have high internal volatility. It may also be the case that the same firms in cash flow quartiles 3 and 4 may be more likely to be dividend payers regardless of internal volatility.

Tax variables. I utilize two tax specific variables to show the effect tax law changes have on payout policy choices. The first tax variable is the *ChangeDivTaxRate* which is simply the one year change in the top United States dividend tax rate. The prior expectation for *ChangeDivTaxRate* is that when the tax rate increases firm may become less likely to pay dividends (or pay as high of a level of dividends per share). On the other hand, when tax rates are decreased dividends should become more desirable for investors and firms may look to increase/initiate dividends.

The other tax related variable I utilize is *RepatTaxCutDummy* which is set equal to one for firms that have positive foreign income (Compustat Item #273) during fiscal years 2004, 2005 or 2006. These years included repatriation tax cuts under the American Job Creation Act. It is likely that firms will be more inclined to initiate or increase (decrease or eliminate) dividends and repurchases in years when the dividend tax rate decreases (increases). Similarly, firms with positive foreign income are likely to be more (less) inclined to initiate or increase (eliminate or decrease) dividends since they are the firms that are subjected to the tax break. It may also be the case the additional foreign income that is repatriated will be utilized for repurchases rather than dividends. Repurchases are generally viewed as more flexible and therefore may be more appropriate for a one-time increase in payouts.

Additional firm-level controls. Other firm-level controls which are utilized include *CashFlow/Assets, LagNetDebt/Assets, NegRetainedEarn and LagReturn.* *CashFlow/Assets* is defined as cash flow divided by total assets where cash flow is measured as earnings before interest, taxes and depreciation (EBITDA in Compustat). Firms with higher levels of cash flow should be in a better position to pay out dividends than firms with lower levels of cash flow. The interaction quartiles are based on this measure.

LagNetDebt/Assets is calculated by dividing the value of net debt in the firm's prior fiscal year by the value of total assets (Compustat Item #6) in the firm's current fiscal year. The value of net debt is set equal to long-term debt (Compustat Item #9) plus debt in current liabilities (Compustat Item #34) minus cash and short-term investments (Compustat Item #1). Firms with large values of net debt from the prior fiscal year should be less likely to initiate or increase their dividends as a substantial portion of free cash may be needed to pay down portions of the debt.

NegRetainedEarn is a dummy variable which is set equal to one if the value of the firm's retained earnings (Compustat Item #36) is negative; and 0 otherwise. If a firm has negative retained earnings it is very unlikely that they are paying a dividend. In many cases it may actually be a covenant violation to pay a dividend with negative retained earnings.

LagReturn is the one-year stock return for the prior fiscal year. Firms that have had substantial rundowns in stock price should be more likely to decrease the level of their dividends. The cause for this can be two-fold. If the firm's stock price is falling because of a decrease in earnings the firm is likely forced to cut its dividend. However, if it is due to a changing environment around the company and its future outlook the firm may still prefer to decrease the dividend to keep the dividend yield from increasing substantially while the likelihood of maintaining the new higher dividend yield becomes low.

Summary Statistics

Summary statistics for my sample are given in Table 2-2 through Table 2-4. Table 2-1 represents the entire sample. Slightly over one quarter (26.7%) of all firms in my sample pay a dividend. This number increases to 34.5% when looking at firms with positive repurchases throughout the fiscal year. Taking into consideration both dividend paying and non-dividend paying firms, the average dividend per share is approximately 16 cents per share.

In Table 2-3 I break the sample down into dividend paying stocks and non-dividend paying stocks. This allows comparisons of common characteristics to each group. In general dividend paying firms are significantly larger, more than doubling the average NYSE percentile classification of non-dividend paying firms. Dividend paying firms are likely to have a lower market-to-book ratio, more debt, higher earnings and cash flow and fewer investment opportunities (as proxied by *dA/A* in Fama and French (2001)). Firms that pay dividends are also more likely to have positive share repurchases. Consistent with the fact that dividend paying firms are less likely to be high volatility growth firms, lag returns for dividend paying stocks are lower than for firms not paying dividends. Very few firms with negative retained earnings level pay dividends. The fact that many covenants are likely to restrict firms from paying dividends if they have negative retained earnings is a probable cause for this finding.

Table 2-4 looks at firms with positive share repurchases during the fiscal year relative to firms with no share repurchases. Repurchasing firms share many of the same characteristics in general as dividend paying firms. They are likely to be larger, have lower market-to-book, higher earnings and cash flow and less investment opportunities. Just as dividend paying firms were more likely to also be repurchasers, repurchasers are more likely to also be dividend payers. It is also true that repurchasers are likely to have lower returns from the prior fiscal year.

Results

Payout Policy – Dividends

Choice to pay dividends or not to pay dividends. The main empirical question of this study deals with the factors that affect the payout policy choices of firms, particularly the effect of external, market-level volatility. Prior literature on payout policy choice has often focused on testing this through the simple choice of paying or not paying a dividend.[10] The first empirical test I employ is to measure the effect my explanatory variables have on the probability that a firm pays a dividend. I utilize a logit model to accomplish this and the results are reported in Table 2-5. However, to best see the impact of the volatility measures I must first look at a linear combination of the coefficient for the base volatility variable (which represents the non-interacted lowest cash-flow quartile, CFQuart1) and the coefficient on the interacted term for cash flow

[10] For example, Fama and French (2001) look at the propensity to pay dividends and Baker and Wurgler (2004) look at the propensity to pay assuming you were a prior payer (PTC), propensity to pay assuming you were not a prior payer (PTI), and propensity to pay assuming you were not prior in the sample (PTL).

quartiles 2 through 4. The results to tests on the linear combination of coefficients are reported in Table 2-6.

Most of the firm-level coefficients come through as would be expected given the summary statistics in Table 2-3. Firms are more likely to pay a dividend if they are larger and have lower market-to-book, higher earnings and cash flow, and have less investment opportunities (as proxied by dA/A). I also find that having negative retained earnings substantially decreases the probability of paying a dividend. As mentioned in the Data section, this should be expected due to the fact that many covenants are likely to restrict dividend payment when retained earnings are negative. Firms are less likely to pay a dividend if they have had a run-down in share price, as evident by the significantly negative coefficient on lag return.

Turning attention to the tax variables, Table 2-5 shows that changes in the dividend tax rate do not have a statistically significant impact on whether or not a firm pays a dividend. However, during the fiscal years associated with repatriation tax cuts due to the American Job Creation Act, it appears that firms with positive foreign income are actually significantly less likely to pay a dividend. This goes against the prior that firms would be more likely to take advantage of being able to repatriate their foreign income with lower repatriation taxes and then utilize this extra domestic free cash flow to payout as a dividend. On the other hand, this may simply show that firms aren't willing to initiate a new payout policy over something as short-term as the American Job Creation Act, but may still be willing to change pre-established levels of dividends.

Table 2-6 is the best way to look at the impact and significance of the key variables of interest dealing with volatility. It appears that market-level volatility (proxied by VIX) only has an impact on low cash-flow firms indicating that they are less likely to pay a dividend when the VIX is high. Internal firm-level volatility, as measured by *ReturnVolatility*, demonstrates that firms with high volatility of cash flow are not likely to pay dividends regardless of the relative level of cash flow during the current fiscal year. The variable *AnalystDispersion* comes through in a somewhat unexpected manner. The only quartile that shows as significant is quartile 3 with a statistically significant increase in the probability of paying a dividend. This is counter-intuitive as the prior would be that firms with high expected volatility of future earnings would be less likely to pay a dividend. However, this variable appears to not have strong predictive power given the non-consistent impact it has on the regression across the quartiles.

Finally, to allow comparison of the direct effect a one standard deviation change in each variable has on the probability of paying a dividend, I run marginal effects.[11] The marginal effects give the impact of a one unit change from the sample means. By multiplying these by one standard deviation for the given variable, I can identify the impact a one standard deviation change in the specific variable has on the probability a firm pays a dividend. Some of the most significant variables on the probability to pay a dividend are *ReturnVolatility* (ranging from -15.9% for firms in cash flow quartile 1 to -20.9% for firms in cash flow quartile 4), *NegativeRetainedEarn* (-12.6%), *CashFlow/Asset* (8.5%), *NYP* (7.1%), *MtoB* (-4.8%), and *dA/A* (-4.8%). To demonstrate how to interpret these results, a one standard deviation increase (decrease) in internal volatility (*ReturnVolatility*) results in approximately a 15.9% decrease (increase) in the probability a firm in quartile 1 pays a dividend. Similar interpretation can be utilized for

[11] In order to avoid an excessive number of tables, the marginal effects tables are not reported. Full tables are available by contacting the author.

each of the other variables. However, since *NegativeRetainedEarnings* is a dummy variable the interpretation is that firms with negative levels of retained earnings are 12.6% less likely to pay a dividend.

Choice to maintain, decrease/eliminate, or increase dividends per share for prior dividend payers. Brav et al (2005) survey 166 financial executives of firms that pay dividends. Of these 166, 93.8% state that they consciously try to avoid reducing the level of dividends per share. Therefore, it may be of more interest to look at what factors affect the decision to change dividend policy at a given point of time, rather than just the factors that affect whether a firm pays or doesn't pay a dividend. The sample is thus broken down into firms that paid a dividend in the prior fiscal year and firms that did not pay a dividend in the prior fiscal year. For the firms that did pay a dividend in the prior fiscal year their options become to maintain the current dividend per share (with a 5% buffer), decrease the dividend per share at least 5%, or increase the dividend per share at least 5%.

Table 2-7 and Table 2-8 look at firms that previously paid a dividend in the prior fiscal year. Table 2-7 represents the multinomial logit where the base case is maintaining the current dividend level (+/- 5%). Table 2-8 is again the linear combination of coefficients for the volatility measures. Looking at the standardized marginal effects of a one standard deviation change, it is evident that firms in general look to either maintain the current dividend per share level (48.9% at the sample means) or increase the dividend per share (42.4% at the sample means). Therefore it is most interesting to see what causes firms that had previously paid a dividend to become more likely to decrease or eliminate their dividend per share or become less likely to increase their dividend per share.

First looking at the firm characteristics shows that firms with smaller (larger) amounts of both earnings and cash flow are significantly more likely to decrease (increase) their dividends. Larger market-to-book ratios tend to lead to more changes in both the positive and negative direction for dividends. Firms that have high asset growth are more likely to increase dividends and less likely to decrease dividends. This would appear to go against the prior for this term if in fact *dA/A* does proxy for investment opportunities as Fama and French (2001) claim. One would likely argue that firms with more investment opportunities would be less likely to pay a higher dividend, and would be instead more likely to try and retain the capital to invest within the company. More (less) debt leads to a lower (higher) probability of increasing dividends per share. Firms with negative retained earnings are much less likely to increase dividends and much more likely to decrease or eliminate as would be expected based on covenants. Finally, firms with strong run-ups in price are more likely to be increasing their dividend, while firms with large price drops are more likely to decrease. This should be the case for several reasons including that firms may be in poor (strong) financial health as the stock price falls (rises) and may also be looking to keep the dividend yield from changing substantially as the price moves significantly in one direction.

Changes in the dividend tax rate appear to only be a significant factor when it comes to decreasing the dividend per share. When the dividend tax increases (decreases) firms become significantly more (less) likely to decrease (increase) their dividend level. However, the repatriation tax appears to show a significant effect only for increasing the dividend. When firms with positive foreign income receive a tax break on repatriating foreign profits back to the United States they take the opportunity to increase dividends to return some of the foreign income back to the investor.

The linear combinations (Table 2-8) again provide the clearer way to interpret the key volatility measures and the differing impact based on the firm's relative cash flow level. Firm-level volatility, represented by *ReturnVolatility*, shows that firms with high internal volatility are more (less) likely to decrease (increase) their dividend. This appears to hold true at all cash flow quartile levels. However, in a couple of cases statistical significance is lost.

For the VIX it appears that the firm's relative cash flow position causes the VIX to have a differing effect. Firms with high cash flow are relatively unaffected by volatile market conditions and appear no more likely to decrease dividends than they would be otherwise.[12] However, for firms with low cash flow, high market volatility does have a significant impact resulting in a significantly higher probability of decreasing their dividend. On the other hand, a high level of VIX does affect firm's that would have likely increased dividends otherwise regardless of relative cash flow. Though the impact is stronger in general on firms with low cash flow, all levels of firms appear to become more conservative about increasing dividends when the VIX measure is higher. This shows that firms are prone to try and maintain extra free cash flow to ensure that they

[12] It should be noted that another explanation exists besides the Lintner (1956) "dividend stickiness" argument for why firms with high enough cash flow levels to be able to maintain their current dividend level would prefer not to adjust their dividend level down. Fuller and Goldstein (2011) show that dividend-paying stocks have higher average returns during declining markets than their non-dividend-paying counterparts. Therefore, firms may prefer to try to maintain (or even increase) their dividend level if their cash level is high enough to allow, even ignoring the penalty that is often associated with decreasing.

have enough cash to make it through until the market stabilizes. These periods are usually associated with a tightening of the credit markets and having internal cash should be more valuable during these times.

With regard to volatility through the analyst dispersion measure it appears that firms with high expected volatility of future cash flow are more likely to decrease dividends, regardless of relative levels of cash flow. On the other hand, firms with higher levels of cash flow and high analyst dispersion are significantly less likely to increase their dividend than firms with lower levels of cash flow and high analyst dispersion. This again is slightly counterintuitive and relatively unexplainable. A firm with relatively low levels of cash coming in and relatively high volatility in future expected earnings would seem to be extremely unlikely to increase its per share dividend. However, they appear to be more likely to increase their dividend than their counterparts with higher cash flow levels.

As with the choice of whether to pay or not, I again run marginal effects and look at the impact of a one standard deviation change from the sample means. Given there are now three choices (maintain dividend, decrease/eliminate dividend, or increase dividend) this allows comparisons of how probabilities are transferred based on the variables. One of the more interesting observations from this occurs when firms have negative retained earnings. As has already been discussed, covenants may require firms to decrease/eliminate dividends during this circumstance; or may at least prohibit them from increasing dividends from the prior level. This shows quite significantly as firms become 11.0% less likely to increase their dividend, 7.8% more likely to decrease, and 3.2% more likely to maintain.

Firms with low cash flow and high internal volatility (as measured by *ReturnVolatility*) prove to be more likely to change their policy in general. A one standard deviation increase in *ReturnVolatility* for firms in the lowest cash flow quartile results in a 18.7% lower probability of the firm maintaining its prior dividend per share, a 8.3% higher probability of decreasing and a 10.4% higher probability of increasing. Turning to the VIX measure shows that a change in the VIX has a very economically significant impact on the firm dividend choice. Just a one standard deviation increase in the VIX (the recent crisis resulted in substantially more than a two standard deviation change for comparison sake) makes a firm in the lowest cash flow quartile 9.4% less likely to increase its dividend per share on average. Many firms then simply maintain their current dividend level instead (firms are 3.1% more likely to maintain) while others are actually forced to decrease (firms are 6.3% more likely to decrease). Given the base probability of decreasing/eliminating a prior dividend level is only 8.7% it becomes quite evident how a several standard deviation change, as with the recent financial crisis, can cause a substantial rise in the number of firms decreasing/eliminating prior dividends (as can be seen in Figure 2-1 and the press release quotes related to recent dividend announcements in the Introduction Section).

Choice to maintain no dividend or initiate a dividend for prior dividend nonpayers. Table 2-9 and Table 2-10 look at the portion of the sample that did not pay a dividend in the prior fiscal year. For these firms the dividend choice is simply whether or not to initiate a dividend. The firm characteristics of firms that initiate dividends are similar to the firm characteristics that distinguished payers from non-payers in Table 2-5. This should be the case in general as these firms are now joining the group of payers that were being described. It appears that firms are much more willing to initiate a dividend only when cash flow levels are high and debt levels are low. This would signify times when the cash position of the firm is most positive allowing them the ability to return some free cash to investors.

It also appears that firms are timing their initiations when looking at the external volatility (VIX) measure. Firms are quite unwilling to initiate a dividend during a poor economic environment. Given that it is commonly recognized that there is a penalty associated with decreasing/eliminating a prior established dividend policy firms are likely to wait for market conditions that they feel comfortable are conducive to maintaining an acceptable level of earnings to continue a newly initiated dividend policy.[13] Therefore when the VIX is high, representing a very unstable (and likely down) market, firms tend not to initiate a dividend. This is particularly true for the firms with lower levels of cash flow during high VIX periods. The firm specific volatility measure also is associated with a lower likelihood of dividend initiation.

Payout Policy – Repurchases

Choice to repurchase or not repurchase shares. Skinner (2008) demonstrates that repurchases are increasingly being used both in addition to and in place of dividends as a means to pay out earnings to investors. Thus it is important to also consider the impact internal and external volatility, taxes, and the rest of my independent variables have on repurchases and not just on dividends. Table 2-11 and Table 2-12 look at the choice to either repurchase or not repurchase shares in a logit regression similar to Table 2-5 and Table 2-5 for dividends.

[13] See Brav et al (2005) for survey evidence that upper-level management recognizes the penalty associated with decreasing/eliminating an established dividend.

The factors that affect the choice to repurchase shares are, for the most part, quite similar to the factors that affect the choice to pay dividends. Table 2-11 shows that larger firms with lower market-to-book ratios, higher earnings and cash flow, and less investment opportunities are more likely to pay dividends. Having a large positive lag return and negative retained earnings also both make a firm less likely to repurchase as they did with dividends. However, the tax and volatility measures appear to have very different impacts on the repurchase choice than they did for the dividend choice. The change in dividend taxes works in the opposite direction though it is still insignificant. The repatriation tax cut dummy on the other hand flips sign and is significantly positive for repurchasing. This finding would appear to imply that when dividends become less attractive to investors firms turn more toward repurchases. A likely explanation for this is that repurchases are often considered by management to be more flexible than dividends. Therefore, management can utilize a one-time increase or initiation in repurchases to distribute the one-time additional cash flow from the repatriation tax break to investors without facing the “dividend stickiness” issues that would arise from an increase or initiation of dividends.[14]

The volatility measures all change to some degree when considering the repurchase decision instead of the dividend decision. In the linear combinations in Table 2-6 the VIX only mattered for the lowest cash flow firms making them less likely to pay a dividend. However, for the repurchase decision, Table 2-12 shows that the VIX only matters for the higher cash flow firms (becoming increasingly significant as cash

[14] Dividend stickiness refers to the argument made in Lintner (1956) which claims that firms are hesitant to increase or initiate dividends without a strong confidence that the new dividend level can be maintained in order to avoid the penalty associated with decreasing or eliminating the dividend in subsequent periods.

flow increases) and makes them more likely to repurchase. The explanation for this would appear to be that firms with high cash flow are actually taking advantage of a beat-down stock price (which should be more likely during a high VIX period) to purchase undervalued shares. Firms with high internal volatility (*ReturnVolatility*) and high expected future internal volatility (*AnalystDispersion*) are, in general, less likely to repurchase shares. The most likely explanation for this would appear to be that these firms are more reluctant to repurchase when their firm specific volatility increases in order to maintain a buffer level of cash within the firm.

The effect of having high firm volatility and high cash flow comes through with very strong economic significance in the marginal effects of a one standard deviation change as well. For firms in cash flow quartile 3 or 4 a one standard deviation increase in volatility of returns results in a decrease in the likelihood of repurchasing of 7.8% or 9.4%, respectively. Given the base probability of repurchasing at the sample means is 32.8% these are clearly very economically significant. A one standard deviation increase in the VIX results in firms in cash flow quartiles 3 and 4 having an increased probability of repurchasing of 6.2% and 7.9%, respectively.

Choice to maintain, decrease/eliminate, or increase repurchasing for prior repurchasers. Table 2-13 and Table 2-14 show the choice to maintain, decrease/eliminate, or increase the level of share repurchases given that the firm repurchased shares during the prior fiscal year. The results in this multinomial regression are somewhat difficult to interpret as, even after increasing the range considered to be maintaining the prior repurchase level to a generous +/- 20%, a relatively small percentage of firms fall into the maintain category. This demonstrates that firms have an extremely large amount of fluctuation in their repurchase policy.

Very few variables come through as significant in determining whether a firm increases their repurchase level. It appears that smaller firms with little-to-no debt and high returns during the prior fiscal year are the most likely to be increasing their repurchase levels. Firms with small cash flow are less likely to increase repurchases when the VIX is high while firms with high cash flow are more likely to increase repurchases when their return volatility is high. This is likely demonstrating that firms with cash available and volatile stock prices are trying to time their repurchasing while firms with low levels of cash are concerned with retaining cash, particularly when the market appears unstable.

It appears that the decision to decrease repurchases is largely dependent upon cash flow and earnings. Interestingly, as with repurchase increases, firms with high cash flow and high return volatility are also more likely to decrease repurchases. Again, this is likely due to them utilizing their cash and volatility of stock price to try and time their repurchases. Therefore they are more likely to both increase and decrease repurchases as they look for low stock price times to repurchase shares.

Given that repurchases are highly unstable over time, it is not clear that the change in repurchase regressions are all that meaningful compared to the decision to simply repurchase or the decision to repurchase after not doing so in the prior year.

Choice to maintain no repurchasing or initiate a repurchase for prior non-repurchasers. Table 2-15 and Table 2-16 look at the choice to initiate repurchases given the firm did not repurchase shares during the prior fiscal year. Firms with low market-to-book, a low level of investment opportunities, high cash flow, little-to-no debt and positive retained earnings are the most likely to initiate repurchases. These would all be things that in general would describe a firm with money available to return to investors and not a lot to use it for internally. It would make sense that the firms that would fit in that category would be the ones most likely to utilize a short-term method to increase the portion of the cash being returned to investors. If the firm felt that a significant portion of the cash that was available would continue to be available in future years, they may also increase/initiate dividends. However, repurchases are a way to get some of the cash to investors without having to worry as much about being able to maintain the payout in the future.

Firms with high cash flow and high return volatility are actually less likely to initiate repurchases. This seems to go a little bit against intuition as it may seem that firms that have experienced high internal volatility but had significant cash would be more likely to use repurchases than dividends. On the other hand, these firms may actually be doing neither and are instead maintaining the cash due to the high internal volatility. In regards to external volatility, it appears that when the VIX is high, firms with high cash flow are more likely to initiate repurchases. This can again likely be attributed to trying to time repurchases. Firms are utilizing this excess cash to buy back underpriced shares when the market fear is increasing.

GARCH Robustness Check

One potential concern that arises from my original sample is that the results are being carried by one or two periods of significant change. My dataset only looks at the years 1990 to 2009 due to the fact that VIX is only calculated back to 1990. However, with only twenty years of data the recent financial crisis, and to a lesser extent the technology bubble of the early 2000s, may make up too significant a portion of my sample. Since the financial crisis saw such large swings in the VIX, just one or two years of data may be influencing my findings quite significantly. To offset this concern I utilize a GARCH estimate of the VIX which allows the dataset to expand back to 1962. I then utilize this new dataset to test if my findings still hold over a nearly fifty year sample. Details of the calculation of the GARCH estimate, as well as all tables discussed in this section, are available in the Appendix.

To first ensure that the GARCH estimate is a good proxy for the VIX I test the correlation between the two variables. I find that a simply GARCH (1,1) estimate over the entire sample period results in a correlation of approximately 0.913. I then use the GARCH estimate and re-run each table from my entire study replacing the VIX variable with the GARCH estimate. I find that my results are not significantly changed with the GARCH estimate as coefficients and magnitudes remain quite stable.

Next, I rerun each logit and multinomial logit on my new full sample consisting of data from 1962 to 2009. The main findings of my study regarding dividend choice remain relatively unchanged. Using the expanded dataset I still show that low cash flow firms are more likely to decrease or eliminate their dividends when market-level uncertainty is high. Similarly, firms across all cash flow levels are unlikely to initiate dividends during times of high market uncertainty. It appears that the recent financial crisis is not solely responsible for my finding that firms become conservative with dividend payouts during high market uncertainty periods given the results hold even with an expanded dataset.

However, the results regarding repurchases do encounter some slight changes when expanding the sample. This makes some sense as the popularity of repurchasing shares has changed substantially since the early 1960s. Therefore, by adding an additional nearly thirty years of data, it may be expected that the results would change to some degree. In the extended sample tests I show that high levels of the GARCH estimate result in increased probability of repurchasing shares and increased probability of initiating a repurchase, regardless of cash flow level. This is slightly different than from the original sample, in which only high cash flow firms were more likely to repurchase or initiate a repurchase during high VIX level periods.

To further ensure that my results are not being carried by the high market uncertainty period of the recent crisis, I also look at only the period 1962 to 1989. This allows me to see the differing impact of all variables prior to the VIX period of my original sample. Again, my original findings appear to stand up to this changed sample period. However, there again are some slightly different impacts for some variables with the change of sample period. While low cash flow firms are still most impacted by periods of high market uncertainty with regards to dividend policy, the impact also appears to impact high cash flow firms more during this early sample than it did during the VIX sample. With regards to repurchases, the 1962 to 1989 period demonstrates that high market uncertainty can be linked to an increased probability of repurchasing regardless of cash flow level.

By using a GARCH estimate of VIX to extend my sample, I believe I demonstrate that my results are robust to changing sample periods. Despite concern that the recent financial crisis may be dominating the VIX sample, it appears that this is not the case.

Even after removing the VIX sample period from the GARCH dataset and rerunning all tables on only the 1962 to 1989 period, the findings are mostly unchanged. However, it does appear that extending the sample period does have some impact on my repurchase choice results as firms become more likely to repurchase or initiate a repurchase during high market uncertainty periods regardless of cash flow level. Overall, I believe this extension of the dataset should ease concern over the possibility of one period of high market uncertainty having too large of an impact on my results.

Conclusion

In this study I show that market-level volatility has an important influence on payout policy. This result holds even after controlling for firm-level cash flow volatility as well as a host of other firm-level characteristics from prior literature. When the market becomes unstable, as proxied by high values of the Chicago Board Options Exchange Volatility Index (VIX), firms make different payout policy decisions than when the market has low volatility/uncertainty. However, I show that the effect of the volatility measures, both internal and external, are not always consistent across firms in different cash flow positions. In many cases, firms with low levels of cash flow react differently (in direction and/or magnitude) than firms with higher levels of cash flow. This may be expected as firms with low cash flow levels may have their hands forced by market-level uncertainty, while firms with high cash flow may actually be able to take advantage of the uncertainty.

In general dividend paying firms with low cash flow are significantly affected by high levels of the VIX. They became significantly more likely to decrease their dividends and significantly less likely to increase their dividends when the VIX is high. However, firms with high cash flow are relatively unaffected. On the other hand, internal volatility (proxied for by the volatility of returns as in Chay and Suh (2009)) tends to cause firms to be more likely to decrease dividends regardless of cash flow and has little impact on the choice to increase dividends.

For non-dividend paying firms, internal and external volatility influences the choice of whether or not to initiate dividends. High market volatility has a very significant negative effect on the probability of initiating whether the firm has high cash flow or low cash flow. Firms appear to push off the decision to initiate until after the market stabilizes. The same is true for internal volatility. Firms with high internal volatility are significantly less likely to initiate dividends regardless of relative cash flow.

In addition to the volatility measures, tax variables are added to look at the effect of dividend tax changes as well as cuts in the repatriation taxes on dividend payouts. Firms do appear to consider tax changes when making payout decisions. When the top tax rate is increased (decreased) firms become more (less) likely to decrease dividends in response. I also show that firms with positive foreign income utilized the American Job Creation Act's repatriation tax relief as an opportunity to increase dividend payouts.

Furthermore, the repurchase choice is considered in the same framework to allow the opportunity to see how internal and external volatility affect the repurchase decision. The results seem to indicate that firms that have high cash flow available tend to try and time the market to allow repurchasing when prices are beaten down by a volatile market. The probability of a firm having positive share repurchases increases significantly when the VIX is high, given that they have relatively high levels of cash flow. This holds true for the probably of a firm initiating a repurchase as well. However, the results are less clear for the choice of the repurchase level for prior repurchasers. The impact of internal volatility on the repurchase decision is also relatively vague.

To ensure that my results are not being driven by the high VIX period that occurred during the recent financial crisis, I calculate a GARCH (1,1) estimate of the VIX which allows my dataset to expand to 1962 through 2009. I then rerun each test using the entire 1962 to 2009 sample as well as the non-overlapping 1962 to 1989 sample. In both the extended overlapping sample as well as the non-overlapping sample, I find that my results are relatively unchanged. This should demonstrate that the results are not only capturing a change relating to a one-time event, but instead a true impact on payout policy caused by market-level uncertainty.

Table 2-1. Variable definitions.

Variable	Definition
AnalystDispersion	The dispersion of opinion amongst analyst forecasts scaled by mean forecast (utilizing IBES Detail Estimates). For this variable to be included in the sample firms are required to have a minimum of 3 analysts covering their stock for a minimum of 4 months during that fiscal year.
Book Value	Stockholder's equity (Compustat Item #216) minus preferred stock (Compustat Item #10) plus deferred taxes and investment tax credits (Compustat Item #35) plus post retirement assets (Compustat Item #15)
CashFlow/Assets	Cash flow divided by total assets where cash flow is measured as earnings before interest, taxes and depreciation (EBITDA in Compustat)
CFQuart2	Dummy variable that is equal to 1 if the firm falls into the second quartile (25% to 50%) for CashFlow/Assets relative to the other firms in the sample, and 0 otherwise
CFQuart3	Dummy variable that is equal to 1 if the firm falls into the third quartile (50% to 75%) for CashFlow/Assets relative to the other firms in the sample, and 0 otherwise
CFQuart4	Dummy variable that is equal to 1 if the firm falls into the fourth quartile (75% to 100%) for CashFlow/Assets relative to the other firms in the sample, and 0 otherwise
ChangeCapGainsTax	Equal to the current year's top capital gains tax rate minus the prior year's top capital gains tax rate
ChangeDivTax	Equal to the current year's top dividend tax rate minus the prior year's top dividend tax rate
dA/A	(Total assets – lag(total assets)) divided by lag(total assets)
DividendPerShare	The ex-date dividends per share for the fiscal year (Compustat Item #26)
E/A	(Income before extraordinary items (Compustat Item #18) plus interest and related expenses (Compustat Item #15) plus deferred incomes taxes (Compustat Item #50)) divided by total assets

Table 2-1 Continued

Variable	Definition
GARCH	Estimate of the VIX using a GARCH(1,1) estimation of the volatility of logarithmic S&P 500 returns.
LagNetDebt/Assets	Lag(net debt) divided by total assets where net debt is equal to long-term debt (Compustat Item #9) plus debt in current liabilities (Compustat Item #34) minus cash and short-term investments (Compustat Item #1)
LagReturn	The one-year stock return for the prior fiscal year
MtoB	Measure of the firm's market-to-book value defined as (total assets (Compustat Item #6) minus book value plus market equity) divided by total assets
Market Equity	Stock's closing price (Compustat Item #24) multiplied by the number of common shares outstanding (Compustat Item #25)
NegativeRetainedEarn	Dummy variable that equals 1 if the firm has negative retained earnings (Compustat Item #36) over total equity (Compustat Item #144) for the current fiscal year, and 0 otherwise
NYP	The firm's market capitalization percentile relative to all NYSE firms (calculated in 5% intervals)
RepatTaxCutDummy	Dummy variable that is equal to 1 if the firm has positive foreign income (Compustat Item #273) during the American Job Creation Act's repatriation tax cut years of 2004, 2005, and 2006
ReturnVolatility	The annualized standard deviation of the prior 24 monthly returns including the current fiscal year multiplied by 100
VIX	Mean value of the CBOE Volatility Index for the first nine months of the firm's fiscal year

Table 2-2. Summary statistics for the whole sample. This table shows summary statistics for the entire sample. Data is from 1990 through 2009.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum	Percent Equal to 1
NYP	75539	0.32	0.31	0.05	1.00	
M/B *	75653	1.99	1.67	0.54	10.71	
dA/A *	75650	0.17	0.50	-0.56	2.99	
E/A *	69956	-0.02	0.23	-1.24	0.25	
VIX	74556	19.80	6.00	12.13	45.69	
ReturnVolatility *	75568	59.41	40.32	14.66	272.19	
CashFlow/Assets *	75435	0.05	0.22	-1.01	0.39	
LagNetDebt/Assets *	67890	0.02	0.35	-0.89	0.66	
NegativeRetainedEarn	75653					39.0%
ChangeDivTax	75653	-0.01	0.05	-0.24	0.09	
RepatTaxCutDummy	75653					4.4%
AnalystDispersion *	31851	0.01	0.01	0.00	0.10	
LagReturn *	68135	0.48	2.21	-0.88	16.68	
Div/Share (All)	75653	0.16	0.60	0.00	51.81	
Positive NetDebt	75653					57.3%
Positive Dividend	75653					26.7%
Repurchaser	75653					34.5%

* Variable winsorized at 1% level

Table 2-3. Summary statistics for dividend non-payers verse dividend payers. This table shows summary statistics for the sample broken down into firms that did not pay a dividend vs firms that did pay a dividend during the current fiscal year. Data is from 1990 through 2009.

Variable	Summary Statistics - No Dividend						Summary Statistics - Dividend					
	Obs.	Mean	Standard Deviation	Min	Max	Percent Equal to 1	Obs.	Mean	Standard Deviation	Min	Max	Percent Equal to 1
NYP	55342	0.25	0.27	0.05	1.00		20197	0.52	0.32	0.05	1.00	
M/B *	55453	2.11	1.91	0.52	11.99		20200	1.68	0.95	0.65	6.05	
dA/A *	55450	0.20	0.59	-0.59	3.55		20200	0.09	0.21	-0.33	1.19	
E/A *	50545	-0.06	0.27	-1.42	0.25		19411	0.07	0.06	-0.18	0.25	
VIX	54655	19.95	5.98	12.13	45.69		19901	19.40	6.04	12.13	45.69	
ReturnVolatility *	55376	69.01	45.11	18.92	316.28		20192	34.19	14.28	12.79	89.76	
CashFlow/Assets *	55299	0.01	0.25	-1.16	0.38		20136	0.15	0.08	-0.06	0.42	
LagNetDebt/Assets *	48193	-0.02	0.37	-0.92	0.68		19697	0.11	0.25	-0.64	0.61	
NegRetainedEarn	55453					50.8%	20200					6.7%
ChangeDivTax	55453	-0.01	0.05	-0.24	0.09		20200	0.00	0.05	-0.24	0.09	
RepatTaxCutDummy	55453					3.4%	20200					6.9%
AnalystDispersion *	19621	0.01	0.02	0.00	0.14		12230	0.00	0.01	0.00	0.04	
LagReturn *	48398	0.63	2.75	-0.90	20.52		19737	0.12	0.61	-0.68	4.41	
Dividend Per Share	55453	0.00	0.00	0.00	0.00		20200	0.60	1.04	0.00	51.81	
Positive NetDebt	55453					52.2%	20200					71.4%
Positive Dividend	55453					0.0%	20200					100.0%
Repurchaser	55453					27.0%	20200					54.9%

* Variable winsorized at 1% level

Table 2-4. Summary statistics for non-repurchasers verse repurchasers. This table shows summary statistics for the sample broken down into firms that did not repurchase shares vs firms that did repurchase shares during the current fiscal year. Data is from 1990 through 2009.

	Summary Statistics - No Repurchase						Summary Statistics - Repurchase					
Variable	Obs.	Mean	Standard Deviation	Min	Max	Percent Equal to 1	Obs	Mean	Standard Deviation	Min	Max	Percent Equal to 1
NYP	49473	0.27	0.28	0.05	1.00		26066	0.42	0.33	0.05	1.00	
M/B *	49567	2.10	1.90	0.54	12.10		26086	1.78	1.20	0.55	7.47	
dA/A *	49565	0.21	0.58	-0.58	3.52		26085	0.10	0.31	-0.48	1.87	
E/A *	45879	-0.05	0.27	-1.39	0.24		24077	0.04	0.14	-0.74	0.27	
VIX	48798	19.42	5.89	12.13	45.69		25758	20.51	6.14	12.13	45.69	
ReturnVolatility *	49500	66.18	45.19	16.54	312.44		26068	46.87	28.40	13.35	179.82	
CashFlow/Assets *	49419	0.02	0.25	-1.17	0.37		26016	0.12	0.14	-0.54	0.43	
LagNetDebt/Assets *	43336	0.02	0.36	-0.92	0.67		24554	0.02	0.31	-0.81	0.63	
NegRetainedEarn	49567					47.9%	26086					22.1%
ChangeDivTax	49567	0.00	0.05	-0.24	0.09		26086	-0.01	0.05	-0.24	0.09	
RepatTaxCutDummy	49567					3.5%	26086					6.0%
AnalystDispersion *	17906	0.01	0.02	0.00	0.13		13945	0.01	0.01	0.00	0.06	
LagReturn *	43487	0.61	2.68	-0.90	20.04		24648	0.25	1.34	-0.82	10.29	
Dividend Per Share	49567	0.11	0.61	0.00	51.81		26086	0.26	0.57	0.00	31.00	
Positive NetDebt	49567					56.8%	26086					58.3%
Positive Dividend	49567					18.4%	26086					42.5%
Repurchaser	49567					0.0%	26086					100.0%

* Variable winsorized at 1% level

Table 2-5. Logit regression for the choice to pay or not pay a dividend. This table shows the logit regression coefficients for the firm's choice to either pay or not pay a dividend. A firm is considered to have a positive dividend if the ex-date dividend per share (Compustat Item #26) is positive. Standard errors are shown in parenthesis. Base choice is to not pay a dividend.

Variable	1		2	
NYP	2.217 (0.21)	***	2.585 (0.19)	***
MtoB	-0.274 (0.03)	***	-0.236 (0.04)	***
dA/A	-0.931 (0.07)	***	-0.985 (0.11)	***
E/A	0.356 (0.29)		-0.278 (0.30)	
VIX	-0.037 (0.01)	***	-0.030 (0.01)	
ReturnVolatility	-0.038 (0.00)	***	-0.042 (0.00)	***
CashFlow/Assets	3.726 (0.51)	***	4.031 (0.51)	***
LagNetDebt/Assets	-0.061 (0.12)		0.937 (0.17)	***
NegativeRetainedEarn	-1.375 (0.04)	***	-1.292 (0.09)	***
ChangeDivTaxRate	0.109 (0.67)		0.837 (0.89)	
RepatTaxCutDummy	-0.226 (0.12)	*	-0.359 (0.15)	**
AnalystDispersion			3.856 (3.42)	
LagReturn	-0.053 (0.01)	***	-0.079 (0.01)	***

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-5 Continued

Variable	1		2	
CFQuart2*VIX	0.031	***	0.008	
	(0.01)		(0.01)	
CFQuart3*VIX	0.030	***	0.021	
	(0.01)		(0.01)	
CFQuart4*VIX	0.031	***	0.029	**
	(0.01)		(0.01)	
CFQuart2*ReturnVol	-0.009	***	-0.001	
	(0.00)		(0.01)	
CFQuart3*ReturnVol	-0.011	***	-0.013	**
	(0.00)		(0.01)	
CFQuart4*ReturnVol	-0.012	***	-0.017	***
	(0.00)		(0.00)	
CFQuart2*Disp			-5.509	
			(3.84)	
CFQuart3*Disp			5.292	
			(4.64)	
CFQuart4*Disp			-0.273	
			(7.75)	
Constant	2.339	***	4.075	***
	(0.37)		(0.72)	
Industry Dummies	Y		Y	
Year Clustered S.E.	Y		Y	
Number of observations	61,680		26,640	
Adjusted R2	0.393		0.406	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-6. Linear combination for the choice to pay or not pay a dividend. This table shows the linear combination of coefficients for the interaction variables from Table 2-5 for the firm's choice to either pay or not pay a dividend. A firm is considered to have a positive dividend if the ex-date dividend per share (Compustat Item #26) is positive. Standard errors are shown in parenthesis. Base choice is to not pay a dividend.

Variable	1		2	
VIX	-0.037	***	-0.030	***
	(0.01)		(0.01)	
VIX + CFQuart2*VIX	-0.006		-0.022	
	(0.01)		(0.02)	
VIX + CFQuart3*VIX	-0.007		-0.008	
	(0.01)		(0.02)	
VIX + CFQuart4*VIX	-0.006		-0.000	
	(0.01)		(0.02)	
ReturnVolatility	-0.038	***	-0.042	***
	(0.00)		(0.00)	
ReturnVolatility+ CFQuart2*ReturnVol	-0.047	***	-0.043	***
	(0.00)		(0.00)	
ReturnVolatility + CFQuart3*ReturnVol	-0.049	***	-0.055	***
	(0.00)		(0.00)	
ReturnVolatility + CFQuart4*ReturnVol	-0.050	***	-0.059	***
	(0.00)		(0.00)	
AnalystDispersion			3.856	
			(3.42)	
AnalystDispersion + CFQuart2*Disp			-1.653	
			(5.01)	
AnalystDispersion + CFQuart3*Disp			9.148	**
			(4.03)	
AnalystDispersion + CFQuart4*Disp			3.583	
			(6.84)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-7. Multinomial logit regression for the choice to maintain or change dividend for prior dividend payers. This table shows the multinomial logit regression for the firm's choice to either maintain or change their dividend given that they paid a dividend during the prior fiscal year. The firm's dividend is measured using the ex-date dividends per share for the fiscal year (Compustat Item #26). Standard errors are shown in parenthesis. Base choice is to maintain prior dividend level.

Variable	Decrease Dividend		Increase Dividend		Decrease Dividend		Increase Dividend	
NYP	-1.149	***	0.609	***	-0.407	*	0.714	***
	(0.24)		(0.09)		(0.21)		(0.11)	
MtoB	0.283	***	0.145	***	0.364	***	0.073	
	(0.07)		(0.05)		(0.08)		(0.05)	
dA/A	-0.447	**	0.726	***	-0.339		0.759	***
	(0.17)		(0.11)		(0.28)		(0.15)	
E/A	-1.760	***	4.099	***	0.433		4.905	***
	(0.42)		(0.96)		(0.60)		(1.25)	
VIX	0.038	***	-0.059	***	0.039	**	-0.081	
	(0.01)		(0.02)		(0.02)		(0.05)	
ReturnVolatility	0.033	***	0.016	***	0.011		0.016	
	(0.01)		(0.01)		(0.01)		(0.02)	
CashFlow/Assets	-1.426		2.238	**	-2.061		2.539	**
	(0.88)		(0.88)		(1.34)		(1.26)	
LagNetDebt/Assets	0.399		-0.835	***	0.054		-1.360	***
	(0.26)		(0.11)		(0.30)		(0.12)	
NegativeRetainedEarn	0.596	***	-0.359	***	0.534	***	-0.254	*
	(0.06)		(0.11)		(0.11)		(0.14)	
ChangeDivTaxRate	2.708	***	-0.211		1.532	***	0.605	
	(0.42)		(0.38)		(0.47)		(0.60)	
RepatTaxCutDummy	-0.222		0.206	**	-0.059		0.201	*
	(0.15)		(0.10)		(0.18)		(0.11)	
AnalystDispersion					54.675	***	-4.420	
					(10.11)		(13.01)	
LagReturn	-0.655	***	0.242	***	-0.561	***	0.191	***
	(0.07)		(0.04)		(0.09)		(0.06)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-7 Continued

Variable	Decrease Dividend		Increase Dividend		Decrease Dividend		Increase Dividend	
CFQuart2*VIX	-0.027		0.021		-0.043	***	0.053	
	(0.01)		(0.01)		(0.02)		(0.05)	
CFQuart3*VIX	-0.053	***	0.038	***	-0.070	***	0.064	
	(0.02)		(0.01)		(0.02)		(0.05)	
CFQuart4*VIX	-0.043	***	0.036	***	-0.065	***	0.061	
	(0.01)		(0.01)		(0.02)		(0.05)	
CFQuart2*ReturnVol	-0.002		-0.023	***	0.016	*	-0.036	**
	(0.01)		(0.01)		(0.01)		(0.02)	
CFQuart3*ReturnVol	-0.002		-0.025	***	0.021	**	-0.033	*
	(0.01)		(0.01)		(0.01)		(0.02)	
CFQuart4*ReturnVol	-0.004		-0.017	***	0.017	*	-0.026	
	(0.01)		(0.01)		(0.01)		(0.02)	
CFQuart2*Disp					-3.369		1.725	
					(8.21)		(16.13)	
CFQuart3*Disp					-6.208		-19.964	
					(8.70)		(21.52)	
CFQuart4*Disp					-13.865		-28.950	
					(12.49)		(23.51)	
Constant	-2.210	***	-0.308		-3.863	***	-0.174	
	(0.48)		(0.37)		(0.66)		(0.45)	
Industry Dummies	Y		Y		Y		Y	
Year Clustered S.E.	Y		Y		Y		Y	
Number of observations	18,553		18,553		11,266		11,266	
Adjusted R2	0.158		0.158		0.168		0.168	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-8. Linear combination for the choice to maintain or change dividend for prior dividend payers. This table shows the linear combination of coefficients for the interaction variables from Table 2-7 for the firm's choice to either maintain or change their dividend given that they paid a dividend during the prior fiscal year. The firm's dividend is measured using the ex-date dividends per share for the fiscal year (Compustat Item #26). Standard errors are shown in parenthesis. Base choice is to maintain prior dividend level.

Variable	Decrease Dividend	Increase Dividend	Decrease Dividend	Increase Dividend
VIX	0.038***	-0.059***	0.039**	-0.081
	(0.01)	(0.02)	(0.02)	(0.05)
VIX + CFQuart2*VIX	0.011	-0.037***	-0.004	-0.027
	(0.01)	(0.01)	(0.01)	(0.02)
VIX + CFQuart3*VIX	-0.015	-0.021*	-0.030***	-0.016
	(0.01)	(0.01)	(0.01)	(0.01)
VIX + CFQuart4*VIX	-0.005	-0.022*	-0.025	-0.019
	(0.01)	(0.01)	(0.02)	(0.01)
ReturnVolatility	0.033***	0.016***	0.011	0.016
	(0.01)	(0.01)	(0.01)	(0.02)
ReturnVolatility+ CFQuart2*ReturnVol	0.031***	-0.008**	0.027***	-0.020***
	(0.00)	(0.00)	(0.00)	(0.01)
ReturnVolatility + CFQuart3*ReturnVol	0.031***	-0.010***	0.032***	-0.017***
	(0.00)	(0.00)	(0.00)	(0.00)
ReturnVolatility + CFQuart4*ReturnVol	0.029***	-0.002	0.028***	-0.010**
	(0.01)	(0.00)	(0.01)	(0.01)
AnalystDispersion			54.675***	-4.420
			(10.11)	(13.01)
AnalystDispersion + CFQuart2*Disp			51.306***	-2.694
			(8.33)	(10.57)
AnalystDispersion + CFQuart3*Disp			48.467***	-24.384*
			(4.71)	(12.80)
AnalystDispersion + CFQuart4*Disp			40.810***	-33.370**
			(9.50)	(14.89)

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-9. Logit regression for the choice to maintain or pay a dividend for prior dividend non-payers. This table shows the logit regression for the firm's choice to either maintain or change their dividend given that they did not pay a dividend during the prior fiscal year. The firm's dividend is measured using the ex-date dividends per share for the fiscal year (Compustat Item #26). Standard errors are shown in parenthesis. Base choice is to maintain no dividend.

Variable	1	2
NYP	0.409*	0.271
	(0.22)	(0.22)
MtoB	-0.188***	-0.247***
	(0.02)	(0.03)
dA/A	-0.344***	-0.598***
	(0.05)	(0.09)
E/A	0.026	0.005
	(0.20)	(0.23)
VIX	0.004	-0.007
	(0.01)	(0.02)
ReturnVolatility	-0.001	0.000
	(0.00)	(0.00)
CashFlow/Assets	1.184***	2.049***
	(0.33)	(0.50)
LagNetDebt/Assets	-1.010***	-1.076***
	(0.08)	(0.15)
NegativeRetainedEarn	-0.359***	-0.203***
	(0.04)	(0.07)
ChangeDivTaxRate	0.032	0.238
	(0.81)	(0.92)
RepatTaxCutDummy	0.222**	0.254*
	(0.09)	(0.14)
AnalystDispersion		-2.723
		(3.05)
LagReturn	0.001	-0.008
	(0.01)	(0.01)

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-9 Continued

Variable	1	2
CFQuart2*VIX	0.012***	0.019***
	(0.00)	(0.01)
CFQuart3*VIX	0.026***	0.033***
	(0.00)	(0.01)
CFQuart4*VIX	0.032***	0.033***
	(0.01)	(0.01)
CFQuart2*ReturnVol	-0.001	-0.003
	(0.00)	(0.00)
CFQuart3*ReturnVol	-0.005***	-0.009***
	(0.00)	(0.00)
CFQuart4*ReturnVol	-0.004**	-0.005**
	(0.00)	(0.00)
CFQuart2*Disp		-12.798**
		(5.90)
CFQuart3*Disp		-0.158
		(5.29)
CFQuart4*Disp		-6.043
		(7.97)
Constant	-1.936***	-1.453**
	(0.42)	(0.60)
Industry Dummies	Y	Y
Year Clustered S.E.	Y	Y
Number of observations	39,877	15,124
Adjusted R2	0.055	0.053

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-10. Linear combination for the choice to maintain or pay a dividend for prior dividend non-payers. This table shows the linear combination of coefficients for the interaction variables from Table 2-9 for the firm's choice to either maintain or change their dividend given that they did not pay a dividend during the prior fiscal year. The firm's dividend is measured using the ex-date dividends per share for the fiscal year (Compustat Item #26). Standard errors are shown in parenthesis. Base choice is to maintain no dividend.

Variable	1		2	
VIX	0.004		-0.007	
	(0.01)		(0.02)	
VIX + CFQuart2*VIX	-0.051	***	-0.054	***
	(0.02)		(0.02)	
VIX + CFQuart3*VIX	-0.048	***	-0.049	***
	(0.01)		(0.02)	
VIX + CFQuart4*VIX	-0.054	***	-0.063	***
	(0.01)		(0.02)	
ReturnVolatility	-0.001		0.000	
	(0.00)		(0.00)	
ReturnVolatility+ CFQuart2*ReturnVol	-0.014	**	-0.026	***
	(0.01)		(0.01)	
ReturnVolatility + CFQuart3*ReturnVol	-0.010	***	-0.027	***
	(0.00)		(0.01)	
ReturnVolatility + CFQuart4*ReturnVol	-0.004		-0.016	**
	(0.00)		(0.01)	
AnalystDispersion			-2.723	
			(3.05)	
AnalystDispersion + CFQuart2*Disp			-1.528	
			(11.42)	
AnalystDispersion + CFQuart3*Disp			5.002	
			(9.77)	
AnalystDispersion + CFQuart4*Disp			4.785	
			(8.57)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-11. Logit regression for the choice to repurchase shares or not repurchase shares. This table shows the logit regression and linear combination for interaction coefficients for the firm’s choice to either repurchase shares or not repurchase shares. A firm is considered to be a repurchaser if total repurchases are positive, where total purchases are defined as purchase of common and preferred stock (Compustat Item #115) plus the minimum of 0 and (preferred stock / redemption value (Compustat Item #56) minus lag(preferred stock / redemption value). Standard errors are shown in parenthesis. Base choice is to not repurchase shares.

Variable	1		2	
NYP	0.841	***	0.809	***
	(0.22)		(0.20)	
MtoB	-0.151	***	-0.186	***
	(0.02)		(0.02)	
dA/A	-0.619	***	-0.828	***
	(0.06)		(0.09)	
E/A	0.097		-0.231	
	(0.21)		(0.25)	
VIX	0.004		0.000	
	(0.01)		(0.02)	
ReturnVolatility	-0.002	**	-0.004	
	(0.00)		(0.00)	
CashFlow/Assets	2.014	***	3.660	***
	(0.29)		(0.48)	
LagNetDebt/Assets	-1.058	***	-1.009	***
	(0.07)		(0.12)	
NegativeRetainedEarn	-0.484	***	-0.325	***
	(0.04)		(0.06)	
ChangeDivTaxRate	-0.331		-0.269	
	(0.80)		(1.06)	
RepatTaxCutDummy	0.337	**	0.353	*
	(0.15)		(0.18)	
AnalystDispersion			-1.565	
			(2.13)	
LagReturn	-0.026	***	-0.038	***
	(0.01)		(0.01)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-11 Continued

Variable	1		2	
CFQuart2*VIX	0.021	***	0.018	
	(0.00)		(0.01)	
CFQuart3*VIX	0.042	***	0.039	***
	(0.00)		(0.01)	
CFQuart4*VIX	0.055	***	0.056	***
	(0.01)		(0.01)	
CFQuart2*ReturnVol	-0.005	***	-0.006	**
	(0.00)		(0.00)	
CFQuart3*ReturnVol	-0.013	***	-0.017	***
	(0.00)		(0.00)	
CFQuart4*ReturnVol	-0.015	***	-0.020	***
	(0.00)		(0.00)	
CFQuart2*Disp			-8.148	*
			(4.24)	
CFQuart3*Disp			2.258	
			(4.32)	
CFQuart4*Disp			-20.353	**
			(8.00)	
Constant	-1.140	***	-0.596	
	(0.39)		(0.46)	
Industry Dummies	Y		Y	
Year Clustered S.E.	Y		Y	
Number of observations	61,823		26,746	
Adjusted R2	0.130		0.123	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-12. Linear combination for the choice to repurchase shares or not repurchase shares. This table shows the linear combination of coefficients for the interaction variables from Table 2-11 for the firm's choice to either repurchase shares or not repurchase shares. A firm is considered to be a repurchaser if total repurchases are positive, where total purchases are defined as purchase of common and preferred stock (Compustat Item #115) plus the minimum of 0 and (preferred stock / redemption value (Compustat Item #56) minus lag(preferred stock / redemption value). Standard errors are shown in parenthesis. Base choice is to not repurchase shares.

Variable	1		2	
VIX	0.004		0.000	
	(0.01)		(0.02)	
VIX + CFQuart2*VIX	0.025		0.018	
	(0.02)		(0.02)	
VIX + CFQuart3*VIX	0.047	***	0.039	**
	(0.01)		(0.02)	
VIX + CFQuart4*VIX	0.060	***	0.056	***
	(0.02)		(0.02)	
ReturnVolatility	-0.002	**	-0.004	
	(0.00)		(0.00)	
ReturnVolatility+ CFQuart2*ReturnVol	-0.008	***	-0.010	***
	(0.00)		(0.00)	
ReturnVolatility + CFQuart3*ReturnVol	0.001	***	-0.020	***
	(0.00)		(0.00)	
ReturnVolatility + CFQuart4*ReturnVol	0.002	***	-0.024	***
	(-0.02)		(0.00)	
AnalystDispersion			-1.565	
			(2.13)	
AnalystDispersion + CFQuart2*Disp			-9.713	***
			(2.73)	
AnalystDispersion + CFQuart3*Disp			2.734	
			(3.44)	
AnalystDispersion + CFQuart4*Disp			-21.918	***
			(7.66)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-13. Multinomial logit regression for the choice to maintain or change repurchase level for prior repurchasers. This table shows the multinomial logit regression and linear combination for interaction coefficients for the firm's choice to either maintain or change their repurchase level given that they repurchased stock during the prior fiscal year. The firm's repurchase level is defined as purchase of common and preferred stock (Compustat Item #115) plus the minimum of 0 and (preferred stock / redemption value (Compustat Item #56) minus lag(preferred stock / redemption value). Standard errors are shown in parenthesis. Base choice is to maintain prior repurchase level.

Variable	Decrease Repurchase		Increase Repurchase		Decrease Repurchase		Increase Repurchase	
NYP	-0.615	***	-0.326	**	-0.502	**	-0.314	**
	(0.18)		(0.13)		(0.23)		(0.16)	
MtoB	-0.003		-0.038		0.021		-0.060	
	(0.03)		(0.04)		(0.03)		(0.05)	
dA/A	0.667	***	-0.064		0.854	***	-0.051	
	(0.23)		(0.22)		(0.29)		(0.31)	
E/A	-1.248	***	0.500		-1.487	***	0.174	
	(0.40)		(0.48)		(0.40)		(0.48)	
VIX	0.037	***	0.001		0.044	***	-0.010	
	(0.01)		(0.01)		(0.02)		(0.01)	
ReturnVolatility	0.006	**	0.002		0.006		0.007	*
	(0.00)		(0.00)		(0.01)		(0.00)	
CashFlow/Assets	-1.742	***	-0.108		-2.143	***	-0.307	
	(0.52)		(0.60)		(0.79)		(0.89)	
LagNetDebt/Assets	0.623	***	-0.288	**	0.491	***	-0.552	***
	(0.10)		(0.14)		(0.15)		(0.17)	
NegativeRetainedEarn	0.041		0.063		-0.194		-0.071	
	(0.10)		(0.09)		(0.15)		(0.16)	
ChangeDivTaxRate	1.572	*	0.461	**	1.899	**	1.049	***
	(0.94)		(0.23)		(0.89)		(0.29)	
RepatTaxCutDummy	-0.361	**	0.012		-0.271	*	0.008	
	(0.14)		(0.10)		(0.14)		(0.13)	
AnalystDispersion					6.180		-22.894	**
					(7.80)		(11.61)	
LagReturn	-0.011		0.071	***	0.008		0.094	**
	(0.04)		(0.03)		(0.05)		(0.05)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-13 Continued

Variable	Decrease Repurchase	Increase Repurchase	Decrease Repurchase	Increase Repurchase
CFQuart2*VIX	-0.009	-0.004	0.001	0.007
	(0.01)	(0.01)	(0.02)	(0.02)
CFQuart3*VIX	-0.016**	-0.001	-0.010	0.000
	(0.01)	(0.01)	(0.02)	(0.02)
CFQuart4*VIX	-0.047***	-0.023***	-0.042**	-0.022
	(0.01)	(0.01)	(0.02)	(0.02)
CFQuart2*ReturnVol	0.004	-0.001	0.001	-0.009**
	(0.00)	(0.00)	(0.01)	(0.00)
CFQuart3*ReturnVol	0.004	-0.001	0.005	-0.002
	(0.00)	(0.00)	(0.01)	(0.01)
CFQuart4*ReturnVol	0.020***	0.012***	0.017***	0.008
	(0.00)	(0.00)	(0.01)	(0.01)
CFQuart2*Disp			5.970	15.423
			(15.05)	(17.46)
CFQuart3*Disp			1.693	12.642
			(11.01)	(10.55)
CFQuart4*Disp			51.456	48.250*
			(31.47)	(28.63)
Constant	0.949	0.772	0.432	0.881
	(0.60)	(0.50)	(0.85)	(0.66)
Industry Dummies	Y	Y	Y	Y
Year Clustered S.E.	Y	Y	Y	Y
Number of observations	21,944	21,944	11,616	11,616
Adjusted R2	0.057	0.057	0.065	0.065

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-14. Linear combination for the choice to maintain or change repurchase level for prior repurchasers. This table shows the linear combination of coefficients for the interaction variables from Table 2-13 for the firm's choice to either maintain or change their repurchase level given that they repurchased stock during the prior fiscal year. The firm's repurchase level is defined as purchase of common and preferred stock (Compustat Item #115) plus the minimum of 0 and (preferred stock / redemption value (Compustat Item #56) minus lag(preferred stock / redemption value). Standard errors are shown in parenthesis. Base choice is to maintain prior repurchase level.

Variable	Decrease Repurchase		Increase Repurchase		Decrease Repurchase		Increase Repurchase	
VIX	0.037	***	0.001		0.044	***	-0.010	
	(0.01)		(0.01)		(0.02)		(0.01)	
VIX + CFQuart2*VIX	0.027	*	-0.003		0.045	**	-0.003	
	(0.02)		(0.01)		(0.02)		(0.01)	
VIX + CFQuart3*VIX	0.021		0.000		0.034	**	-0.009	
	(0.02)		(0.01)		(0.02)		(0.01)	
VIX + CFQuart4*VIX	-0.010		-0.022	***	0.002		-0.031	***
	(0.02)		(0.01)		(0.02)		(0.01)	
ReturnVolatility	0.006	**	0.002		0.006		0.007	*
	(0.00)		(0.00)		(0.01)		(0.00)	
ReturnVolatility+ CFQuart2*ReturnVol	0.009	***	0.001		0.007	**	-0.002	
	(0.00)		(0.00)		(0.00)		(0.00)	
ReturnVolatility + CFQuart3*ReturnVol	0.010	***	0.001		0.011	***	0.005	
	(0.00)		(0.00)		(0.00)		(0.00)	
ReturnVolatility + CFQuart4*ReturnVol	0.025	***	0.013	***	0.023	***	0.015	***
	(0.00)		(0.00)		(0.00)		(0.00)	
AnalystDispersion					6.180		-22.894	**
					(7.80)		(11.61)	
AnalystDispersion + CFQuart2*Disp					12.150		-7.471	
					(9.69)		(9.37)	
AnalystDispersion + CFQuart3*Disp					7.874		-10.252	
					(8.32)		(9.65)	
AnalystDispersion + CFQuart4*Disp					57.636	**	25.356	
					(28.46)		(26.96)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-15. Logit regression for the choice to initiate a repurchase for prior non-repurchasers. This table shows the logit regression and linear combination for interaction coefficients for the firm's choice to either maintain or change their repurchase level given that they did not repurchase stock during the prior fiscal year. The firm's repurchase level is defined as purchase of common and preferred stock (Compustat Item #115) plus the minimum of 0 and (preferred stock / redemption value (Compustat Item #56) minus lag(preferred stock / redemption value). Standard errors are shown in parenthesis. Base choice is to maintain not repurchasing shares.

Variable	1		2	
NYP	0.409 (0.22)	*	0.271 (0.22)	
MtoB	-0.188 (0.02)	***	-0.247 (0.03)	***
dA/A	-0.344 (0.05)	***	-0.598 (0.09)	***
E/A	0.026 (0.20)		0.005 (0.23)	
VIX	0.004 (0.01)		-0.007 (0.02)	
ReturnVolatility	-0.001 (0.00)		0.000 (0.00)	
CashFlow/Assets	1.184 (0.33)	***	2.049 (0.50)	***
LagNetDebt/Assets	-1.010 (0.08)	***	-1.076 (0.15)	***
NegativeRetainedEarn	-0.359 (0.04)	***	-0.203 (0.07)	***
ChangeDivTaxRate	0.032 (0.81)		0.238 (0.92)	
RepatTaxCutDummy	0.222 (0.09)	**	0.254 (0.14)	*
AnalystDispersion			-2.723 (3.05)	
LagReturn	0.001 (0.01)		-0.008 (0.01)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-15 Continued

Variable	1		2	
CFQuart2*VIX	0.012	***	0.019	***
	(0.00)		(0.01)	
CFQuart3*VIX	0.026	***	0.033	***
	(0.00)		(0.01)	
CFQuart4*VIX	0.032	***	0.033	***
	(0.01)		(0.01)	
CFQuart2*ReturnVol	-0.001		-0.003	
	(0.00)		(0.00)	
CFQuart3*ReturnVol	-0.005	***	-0.009	***
	(0.00)		(0.00)	
CFQuart4*ReturnVol	-0.004		-0.005	**
	(0.00)		(0.00)	
CFQuart2*Disp			-12.798	**
			(5.90)	
CFQuart3*Disp			-0.158	
			(5.29)	
CFQuart4*Disp			-6.043	
			(7.97)	
Constant	-1.936	***	-1.453	**
	(0.42)		(0.60)	
Industry Dummies	Y		Y	
Year Clustered S.E.	Y		Y	
Number of observations	39,877		15,124	
Adjusted R2	0.055		0.053	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table 2-16. Linear combination for the choice to maintain or increase repurchase level for prior non-repurchasers. This table shows the linear combination of coefficients for the interaction variables from Table 2-15 for the firm's choice to either maintain or change their repurchase level given that they did not repurchase stock during the prior fiscal year. The firm's repurchase level is defined as purchase of common and preferred stock (Compustat Item #115) plus the minimum of 0 and (preferred stock / redemption value (Compustat Item #56) minus lag(preferred stock / redemption value). Standard errors are shown in parenthesis. Base choice is to maintain not repurchasing shares.

Variable	1	2
VIX	0.004 (0.01)	-0.007 (0.02)
VIX + CFQuart2*VIX	0.016 (0.02)	0.012 (0.02)
VIX + CFQuart3*VIX	0.030** (0.01)	0.026 (0.02)
VIX + CFQuart4*VIX	0.035** (0.01)	0.026 (0.02)
ReturnVolatility	-0.001 (0.00)	0.000 (0.00)
ReturnVolatility+ CFQuart2*ReturnVol	-0.002** (0.00)	-0.002 (0.00)
ReturnVolatility + CFQuart3*ReturnVol	-0.006*** (0.00)	-0.009*** (0.00)
ReturnVolatility + CFQuart4*ReturnVol	-0.005*** (0.00)	-0.005** (0.00)
AnalystDispersion		-2.723 (3.05)
AnalystDispersion + CFQuart2*Disp		-15.521*** (4.74)
AnalystDispersion + CFQuart3*Disp		-2.881 (3.95)
AnalystDispersion + CFQuart4*Disp		-8.766 (7.40)

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

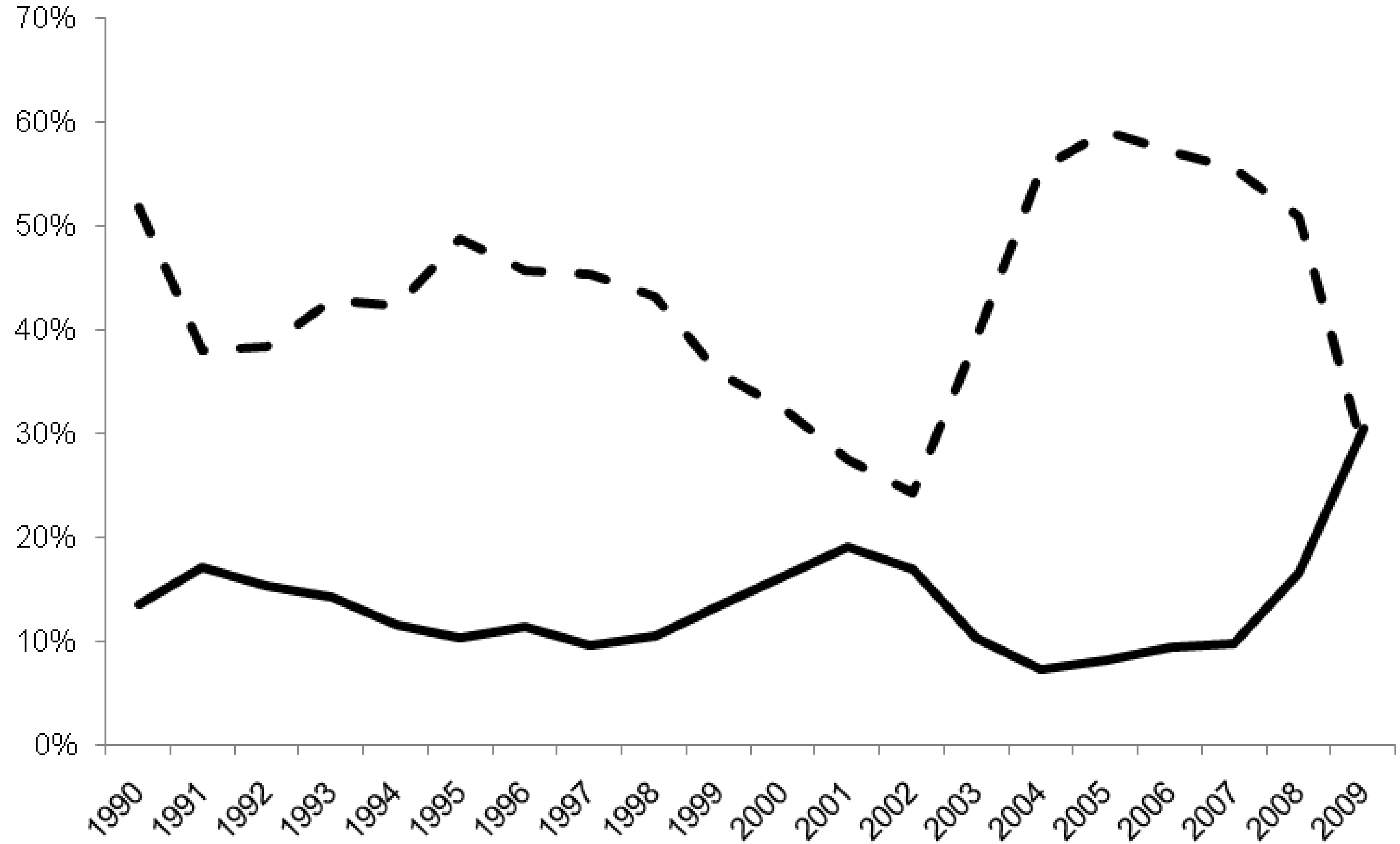

Figure 2-1. Percentage of firms decreasing/eliminating dividends vs percentage of firms increasing dividends by year. This figure compares the percentage of firms either decreasing or eliminating their dividends to the percentage of firms increasing their dividends. The cutoff for decreasing/increasing is a change in dividends per share (adjusted for splits) of -5% or 5%, respectively. The dashed line represents the percentage of firms increasing their dividends and the solid line represents the percentage of firms decreasing their dividends.

CHAPTER 3
PRICE DISCOVERY AND RECENT TRENDS IN EXTENDED-HOURS TRADING

What happens to stock prices after the closing bell rings at the New York Stock Exchange? Do all investors simply pack up and quit thinking about the stock price until the opening bell rings at 9:30 am the next trading day? Does information about the underlying company lay stagnant for the next seventeen and a half hours? Of course not! Information that can affect the company's stock price continues to flow no matter the time of the day. In fact, as the ease of information flow has improved exponentially over the past couple of decades thanks to the internet as well as increased globalization, the amount of information released outside of normal stock market trading hours has increased as well.

How does this new information get reflected into the company's stock price outside of normal trading hours? Some stocks are traded on multiple stock exchanges allowing investors to trade on one exchange in hours when the other(s) may be closed. However, even if a stock is not cross-listed it is possible to trade outside of normal trading hours. Starting in 1999 extended-hours trading was made available to all investors. I examine the changes and trends that have occurred in extended-hours trading since 1999. I also consider the impact extended-hours trading has had on the price discovery process throughout the day.

Barclay and Hendershott (2003) provide the most detailed look to date into the extended-hours trading environment and the price discovery that occurs outside of normal trading hours. However, their sample consists of only NASDAQ trades for the year 2000. I expand on their sample to include all firms in the Standard and Poor's 1500 Composite Index for the years 1999 to 2009. By significantly increasing the sample and including a time-series aspect, I am able to demonstrate the trends that have occurred in extended-hours trading over time as well as give a much more complete overview of the extended-hours trading environment.

Chordia, Roll and Subrahmanyam (2011) show that there has been a recent trend in trading resulting in a very high volume of smaller trades. Turnover has actually increased through their sample (1999 to 2008) despite a significant decrease in the average trade size. The difference is more than made up by the fact that the volume of trades has increased so significantly. I investigate whether this same trend has transferred to extended-hours trading. While I find that the volume of trading occurring outside of regular trading hours has steadily increased at a rather strong pace, I do not find that the average trade size has behaved similarly to the behavior Chordia, Roll and Subrahmanyam (2011) find for all trading. However, beginning in late 2008 / early 2009 a pattern does begin to arise which suggests that extended-hours trading may be starting to mimic the high volume, small-trade size pattern.

Similar to Barclay and Hendershott (2003), I examine the amount of price discovery that takes place before the market opens and after the market closes. Given my time series dataset, I have the opportunity to also look at how this price discovery process changes over the years. I find that there has been a significant shift in price discovery throughout the day such that the non-trading hours are now nearly as important for the price discovery process as are the regular trading hours. In fact, using Barclay and Hendershott's (2003) Weighted Price Contribution measure I demonstrate that the non-trading hours actually account for over half (57.52%) of the total price discovery for Standard & Poor's 500 Large-Cap Index firms (an increase from only

10.11% in 1999). I utilize both Barclay and Hendershott's (2003) Weighted Price Contribution (WPC) measure and a newly created Absolute Price Discovery (APD) measure, which should be a better indicator of actual price discovery during time intervals, to investigate the shifts in price discovery over time. Even after controlling for a potential upward bias of the WPC, I still demonstrate a significant increase in price discovery outside of trading hours. Using my APD measure the extended-hours price discovery increases from 5.71% in 1999 to 25.28% in 2009. The impact is even more profound for large market capitalization stocks that comprise the S&P 500 with an increase from 6.05% in 1999 to 41.09% in 2009. Both measures clearly demonstrate the increased importance of extended-hours trading in the formation of price changes throughout the day.

The increased price discovery occurring prior to 9:30 am and after 4:00 pm can likely be attributed to many factors. One such potential factor is an increased propensity to announce earnings outside of trading hours. Given the amount of new information that is usually contained in an earnings announcement, it follows that increased price discovery is going to occur immediately following these announcements. As firms become more likely to announce outside of trading hours the amount of price discovery occurring outside of trading hours is increased on these dates. Other potential factors that may be aiding the shift in price discovery include improved ease of information flow at all times of the day, rapidly growing importance of the global market, and easier access to extended-hours trading through improved trading technology.

Overview of the Existing Extended-Hours Trading Literature

The early literature on extended-hours trading mostly focused on two distinct areas. The first area deals with the changes in stock value that occurred during the non-trading period which was reflected at the opening of trade the next day. Examples of papers in this area include Oldfield and Rogalski (1980) and Houston and Ryngaert (1992). Oldfield and Rogalski (1980) demonstrate that stock returns follow a different jump process during overnights, holidays, weekends and holiday-weekends. Houston and Ryngaert (1992) show that weekly volume and stock return variance remains relatively unchanged during weeks with reduced trading hours. In these cases they find that the volume and variance is instead shifted to the trading days following the closing of the stock market. The second area focuses on stocks that are listed on at least one stock market outside of the U.S. as well as being listed on one of the major U.S. exchanges. For example, Neumark, Tinsley, and Tosini (1991) found that price changes on the U.S. exchanges were adequately incorporated the next day in the international markets, but the opposite wasn't always the case.

However, extended-hours trading has come a long way since these early articles. Trading jointly listed stocks on an alternative exchange is no longer the only manner of trading a stock after-hours and looking at the opening of trading the next trading day is not the only way to observe stock price changes outside of trading hours. Extended-hours trading began in 1975 but was originally limited to only institutional investors and large block trades. It wasn't until 1999 that regular investors were allowed to trade outside of the normal 9:30 am to 4:00 pm trading day. Due to this fundamental change, I will focus on the more modern strand of the literature which looks at the extended-hours market since the rule change in 1999.

One of the most important papers in the current extended-hours literature is Barclay and Hendershott (2003). This paper is not only important because of its overall findings, but also because it has the most comprehensive summary statistics concerning extended-hours trading. The authors show a clear picture of extended-hours trading relative to regular trading hours. The data used by Barclay and Hendershott (2003) contains all after-hours trades and quotes for NASDAQ-listed stocks for 212 trading days during 2000. They show that these stocks collectively average around 25,000 after-hours trades per day. This represents almost 4% of the daily total trading volume on average. Throughout their study they focus on the 250 highest-volume stocks from their sample, which they show represents about 75% of all after-hours trading. Barclay and Hendershott (2003) demonstrate in Figure 1 of their paper that after-hours trading is strongest directly before the open and after the close of regular trading hours. It also demonstrates that volatility follows the same pattern, but with a much less severe drop-off during after-hours trading. The main finding of Barclay and Hendershott (2003) is that the amount of information on a per-trade basis during extended-hours trading is significantly higher than during regular trading hours. Therefore, even though the volume of trading is significantly lower, there is still strong price discovery outside of regular trading hours.

Barclay and Hendershott (2003) also make other interesting observations about extended-hours trading. First, they argue that the lack of popularity of extended-hours trading likely stems from their finding that there is a higher probability of information-based trades on a per-trade basis outside of regular hours. Smaller liquidity traders prefer to trade together to minimize the likelihood of trading against informed traders and are therefore better off pooling together during regular trading hours when the per trade likelihood of informed trading is lower and trading costs are smaller. They also touch on how the different characteristics of extended-hours trading could affect whether or not a firm releases earnings announcements during regular trading hours or after-hours. In their paper they claim, “The noisier stock prices and less efficient price discovery after hours could affect firms’ decisions about the timing of their public announcements, such as earning announcements. Announcements made after hours are likely to generate greater volatility and larger price reversals than are announcements made during the trading day.” (Barclay and Hendershott, 2003, p. 1070) The idea of extended-hours trading affecting firms’ decisions on public announcements has generated some interest in recent years including Greene and Watts (1996), Bagnoli, Clement and Watts (2006), and others.

In Barclay and Hendershott (2004) the authors use essentially the same sample as Barclay and Hendershott (2003) to look at extended-hours trading and its effect on market microstructure characteristics. They look specifically at how the lack of trading outside of normal trading hours affects trading costs through bid-ask spreads. Their results are consistent with what should be expected. The lack of liquidity in the extended-hours market results in higher trading costs. Both quoted and effective spreads increase significantly outside of normal trading hours. The percentage effective half spread moves from an average of approximately 0.17% during the trading day to approximately 0.6% after-hours. They also find that spreads become significantly larger for stocks with lower trading volume. Barclay and Hendershott (2004) then break the bid-ask spread down into its three fundamental components: inventory holding costs, order processing costs, and adverse selection costs.[15] They find that the adverse selection component of the spread is 15 times larger during the pre-open than during normal trading hours and 7 times larger during the post-close than during normal trading hours. They sum up why they feel extended-hours trading will never grow much beyond its current low level of trading with the following thoughts:

> The magnitude of the liquidity externalities suggest that exchanges have little incentive to expand their trading hours due to competitive pressure. Despite the wide spreads, profit opportunities for dealers to provide liquidity appear limited and the high adverse selection and low trading activity make monitoring the market costly. The wide spreads should discourage investors from trading after hours unless they have very high liquidity demands or short-lived private information. Finally, the investor protections, for example, warnings of high trading costs and volatility, currently employed by brokers and regulators should be continued. (Barclay and Hendershott, 2004, p. 709)

There are relatively few other papers that look at the current extended-hours trading market. One such paper that does is Zdorovtsov (2003). Zdorovtsov (2003) looks mostly at the volatility over the extended-hours period and considers the private and public information hypotheses. One of the main findings of the paper is that a large amount of trading volume in the pre-open period coincides with higher volatility in overnight returns and lower volatility during regular trading hours. According to the author this represents a shift in the price discovery toward the pre-open hours. Another important finding of the paper is that the greater the flow of public information after hours the greater the after-hours volatility (and the same is true for during normal trading hours). Finally, Zdorovstov (2003) finds evidence (as in prior studies) that information releases outside of trading hours are of greater economic significance than information releases during trading hours.

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[15] As found in Stoll (1989)

Data

The core data for the panel utilized in this study consists of all trades made prior to 9:30 am or after 4:00 pm for the years 1999 through 2009. The trade-by-trade data is from the New York Stock Exchange Trades and Quote (TAQ) database. Along with the exact date, time, price and volume of the trade, the TAQ data also identifies the exchange on which the trade occurred as well as distinguishing the "condition" of the trade. By utilizing the condition code from the TAQ database, I eliminate all trades that may not represent an actual extended-hours trade or may not actually be contributing to the true price discovery process.[16]

The panel of extended-hours trades is linked to the firm's CUSIP using the TAQ Master file from Wharton Research Data Services (WRDS). The data is then matched to the constituents of the Standard and Poor's Composite 1500 index (S&P 1500) using Compustat's Index Constituents database. Firms are only maintained in the sample if they were included in the S&P 1500 for at least one day of the year. By limiting the sample to only the S&P 1500 I keep the sample from being too large while still keeping a broad representation of the United States stock market and allowing comparison of large market capitalization (S&P 500), mid-size market capitalization (S&P 400), and small market capitalization (S&P 600) stocks. The data is then matched to the Center for Research in Security Prices (CRSP) database. From CRSP I obtain the firm's primary exchange, monthly trade volume and shares outstanding.

[16] For example, trades with a condition code of "W" are eliminated due to the fact they may improperly affect the appearances of the price-discovery process. These trades are defined as "A trade where the price reported is an average of the prices for transactions during all or any portion of the trading day." An example of trades that are eliminated due to fear that they are not actual extended-hours trades are trades with a condition code of "Z". These trades are defined as "A transaction that is reported to the tape at a time later than it occurred and when other trades occurred between the time of the transaction and its report time." (New York Stock Exchange, 2008)

Trends in the Extended-Hours Trading Environment

Chordia, Roll and Subrahmanyam (2011) show that there has been a trend toward increased share turnover despite a drop-off in the average trade size. The cause for this, as demonstrated in Chordia, Roll and Subrahmanyam (2011), is that stock trading has shifted towards a larger concentration of very frequent, but small trades. They document this trend by looking at trades of NYSE stocks for a sample period from 1993 to 2008 using TAQ data. In a similar manner, I look to see whether a comparable pattern has occurred during the non-trading hours. Though my sample period is shorter due to the fact that regular investors were not given access to extended-hours trading until 1999, my panel data spans a significant enough portion of Chordia, Roll and Subramanyam's (2011) sample period that I should be able to document a similar pattern if it exists.

Similar to Chordia, Roll and Subrahmanyam (2011), I calculate the monthly average turnover by firm. However, instead of using monthly trading volume as the numerator I use monthly extended-hours trading volume. This allows me to look at the monthly turnover that occurs outside of normal trading hours. Monthly extended-hours turnover for firm *i* during month *j* is calculated as the total number of shares traded outside of normal trading hours for firm *i* during month *j* divided by the total number of shares outstanding for firm *i* at the end of month *j*. Table 3-1 shows the monthly turnover across time.

The data is also separated out into large-cap (S&P 500), mid-cap (S&P 400) and small-cap (S&P 600) firms. Figure 3-1 looks at the data graphically. From Figure 3-1 it seems that the exponential increase in turnover that Chordia, Roll and Subrahmanyam (2011) demonstrate has occurred during regular trading hours has not necessarily transferred over to the extended-hours trading period as turnover was relatively stagnant from 2002 to 2006. However, there is a significant jump in extended-hours turnover from early 2007 to the middle of 2009 with the most dramatic spikes occurring early 2007 and late 2008 / early 2009. Another interesting observation from the turnover data is that there is not a significant difference in turnover between small-cap, mid-cap and large-cap stocks in the extended-hours trading period. This is somewhat surprising as one might expect that large-cap firms would be more likely to be paid attention to outside of trading hours, resulting in higher extended-hours turnover than for small-cap firms.

To look more closely at whether or not a similar pattern is occurring during extended-hours trading as is occurring during regular trading hours, I look at the number of trades per month (Table 3-2 and Figure 3-2) as well as the size of the average trade (Table 3-2 and Figure 3-3). From Figure 3-2 it is evident that there is a significant upward trend in the number of extended-hours trades taking place over time. Similar to what Chordia, Roll and Subrahmanyam (2011) identify during regular trading hours, a pattern of increased frequency of smaller trades is evident in the extended-hours environment. However, this pattern does not show until the last year of my sample, 2009. In 2009 the average trade size drops from about 3,000 shares and a total value of approximately $100,000 to about 1,000 shares and a total value of approximately $25,000. However, this shift is not nearly as prolonged or as significant as the shift documented by Chordia, Roll and Subrahmanyam (2011). Therefore it appears that the trend towards a higher frequency of smaller trades that has occurred over recent years has not necessarily had the same impact on the extended-hours trading environment.

As in Barclay and Hendershott (2003), I break the trading down into 30-minute intervals to measure the amount of trading volume across time for the non-regular trading hours. The results are shown in Table 3-3 and Figure 3-4. As would be expected, the majority of extended-hours trades occur close to the opening of trading at 9:30 am and the close of trading at 4:00 pm. From prior studies, such as Jain and Joh (1988), it is known that a u-shaped pattern exists between 9:30 am and 4:00 pm. Therefore if I were to fill in the gap between 9:30 am and 4:00 pm it would likely show a huge jump in trading right at 9:30 am which would come down to create the left-side of the u until approximately 1:00 pm and then turn back up creating the right-side of the u reaching its peak at 4:00 pm. From there it would show a large drop back down to the 4:00 pm to 4:30 pm level and a continued decrease through the overnight period.

Additionally, I explore the breakdown of extended-hours trades by trading venue. Table 3-4 and Figure 3-5 demonstrate the percentage of trades classified as occurring on each individual venue by year. Around the turn of the Twenty-First Century extended-hours trading was dominated by the NASDAQ with over 98% of all trades. From 2002 to 2005 the National Stock Exchange (NSX) appears quite relevant with approximately 25% of all trades. However, Chung and Kim (2009) state that the exchange code associated with NSX may be reflecting trades that occurred on the Island Exchange. Island was acquired in 2005 by NASDAQ which would explain the shift in trading volume from NSX to NASDAQ in 2006. Another large player is the Archipelago Exchange (ARCA) which became relevant in 2003. ARCA was acquired by the New York Stock Exchange in 2005. In recent years the extended-hours market has been dominated by the NASDAQ and NYSE (through ARCA) exchanges, with NASDAQ having 53.15% of the volume while ARCA has 40.31%. The only other exchange threatening the two major players as of 2009 is the BATS Exchange, an electronic crossing network (ECN).

Price Discovery in Extended-Hours Trading

Potentially more interesting than just the surface trends that are occurring in extended-hours trading is the amount of price discovery that takes place outside of the normal 9:30 am to 4:00 pm trading sessions. As the financial world becomes increasingly a global entity we may expect to see a greater percentage of price discovery happening outside of regular trading hours. While the United States markets are closed information is still flowing both inside the United States and outside the United States. For example, firms have been announcing earnings during the pre-open or post-close periods with increasing frequency. The large amount of potentially significant new information that can be revealed during an earnings announcement should likely shift some of the price discovery process into the non-trading periods on days around these extended-hours information releases. Another factor that may have a positive impact on the price discovery in extended-hours trading is the increasing ease of information flow at all hours of the day. When considering this increased flow of information with an always growing impact of the global market one can easily understand the potential for an increased importance of extended-trading hours on the price discovery process.

Barclay and Hendershott (2003) have previously looked at the price discovery process that occurs outside of normal trading hours. However, their sample only allows them to look at the amount of price discovery taking place during one singular year, 2000. It also only looks at NASDAQ stocks and only considers the top 250 by volume.

Therefore, they do not capture changes in the price discovery over time, instead only capturing the amount of price discovery one year after regular investors were introduced to after-hours trading.

I start by using methodology similar to that used in Barclay and Hendershott (2003). I recreate their Weighted Price Contribution (WPC) measure for each day and each time period, *i*, such that WPC is defined as:

$$WPC_i = \sum_{s=1}^{S} \left(\frac{|ret_s|}{\sum_{s=1}^{S} |ret_s|} \right) * \left(\frac{ret_{i,s}}{ret_s} \right) \tag{3-1}$$

where $ret_{i,s}$ is the logarithmic return for stock *s* during period *i* and ret_s is the close-to-close return for stock *s*.[17] Periods are segments of the trading day consisting of post-close (closing price of the prior trading day to 6:30 pm the prior trading day), overnight (6:30 pm the prior trading day to 8:00 am), pre-open (8:00 am to the last trade prior to the open of trading) and regular trading hours (last trade prior to the open of trading to the close of trading).

The results using Barclay and Hendershott's (2003) WPC measure are shown in Table 3-5 and Figure 3-6. For the entire sample (the S&P 1500), the percentage of price discovery that occurs outside of trading hours increases from 8.49% in 1999 to 32.35% in 2009 according the WPC measure. The impact is even stronger for the large-capitalization stocks that make up the S&P 500 as the percentage increases from 10.11% to 57.52%. These firms are likely to experience more price discovery outside of trading hours as they generally receive more attention from investors resulting in more

[17] The methodology for the Weighted Price Contribution (WPC) is first utilized in Barclay and Warner (1993). Several papers have looked at the effectiveness of this measure, including van Bommel (2009) and Wang and Yang (2010).

liquidity, have more information being released throughout the day by the media and are more likely to have an international presence.

Table 3-5 also breaks the price discovery in extended-hours trading down into three more specific segments: post-close (4:00 pm to 6:30 pm), overnight (6:30 pm to 8:00 am) and pre-open (8:00 am to 9:30 am). While it is evident that each time interval has gained significance in the price discovery process, the overnight period stands out as having the most growth. Starting in 1999 and moving through the early 2000s, the overnight period had essentially zero effect on the stock price. However, in the late 2000s it becomes nearly as important for price discovery as the pre-open period. This is especially true for the large market-capitalization stocks that comprise the S&P 500 where the overnight period actually passes the pre-open period for price discovery in 2008.

One potentially concerning issue with using the WPC measure from Barclay and Hendershott (2003) is the impact price reversals can have on the WPC for a specific time interval. For example, consider a situation where stock XYZ closes day 0 at a price of $100.00. During the extended-hours periods between the close on day 0 and the last trade prior to the 9:30 am open on day 1 the stock price increases to $101.50. However, during regular trading hours new information is revealed that pushes the price back to $101.00. Using the WPC methodology of Barclay and Hendershott (2003) the second variable in Equation 3-1, $\left(\frac{ret_{i,s}}{ret_s}\right)$, will be greater than 1 for the extended-hours period and negative for the regular trading hours. However, what occurs during the 9:30 am to 4:00 pm trading session is not necessarily negative price discovery; it is simply price discovery in the opposite direction of what occurred in extended-hours trading. Therefore, I create a new measure, Absolute Price Discovery (APD), which measures price discovery such that price movement during any given interval is considered positive price discovery regardless of the direction relative to the full time period. APD is measured as:

$$\mathrm{APD_i} = \sum_{\mathrm{s=1}}^{\mathrm{S}} \frac{\left(\mathrm{ret_{i,s}}\right)^2}{\sum_{\mathrm{i=1}}^{\mathrm{I}}\left(\mathrm{ret_{i,s}}\right)^2} \tag{3-2}$$

where $ret_{i,s}$ is the logarithmic return for stock *s* during period *i*. This measure should better capture the true price discovery process that occurs within each time interval as it treats both positive and negative price movements as positive price discovery.

The results using APD instead of WPC are shown in Table 3-6 and Figure 3-7. When utilizing the APD measure the proportion of price discovery that occurs during extended-hours trading is reduced. This is due to the fact that there are often days where the price discovery during regular trading hours will turn in the opposite direction of the price discovery that has already taken place leading up to the opening trade. By counting this as positive price discovery instead of negative price discovery it lessens the percentage impact of what has occurred outside of trading hours. However, even after eliminating the upward bias on the amount of price discovery taking place during extended-hours trading that is caused by the WPC measure, the APD measure still demonstrates a strong shift in the price discovery process towards the non-trading hours. For the entire sample, the S&P 1500, the percentage of price discovery taking place increases from 5.71% in 1999 to 25.28% in 2009. As with the WPC measure, the non-trading hours' price discovery is even larger for the large market-capitalization S&P 500 stocks. The APD for the S&P 500 increases from 6.05% in 1999 to 41.09% in 2009. Looking at the specific time intervals, post-close, overnight and pre-open, the pattern remains quite similar to that of the WPC measure. However, the overnight period does not pass the pre-open period in amount of price discovery as it does for the WPC measure. From both the WPC measure and the APD measure it is quite apparent that the trading which occurs before the market opens at 9:30 am and after the market closes at 4:00 pm has become a large part of the price discovery process.

Conclusion

Extended-hours trading has been a mostly ignored topic in the academic finance literature. Barclay and Hendershott (2003) look closely at the after-hours trading environment and the amount of price discovery that takes place outside of normal trading hours. However, their dataset is comprised of only one year, 2000, and is not far removed from 1999 when regular investors were first granted access to extended-hours trading. In this study I use a large dataset of all extended-hours trades of stocks in the S&P 1500 Composite Index from 1999 to 2009 to demonstrate how extended-hours trading has changed over time. While turnover has increased, the pattern over time does not mimic the regular trading hours' pattern identified by Chordia, Roll and Subrahmanyam (2010). They show that turnover has quickly increased since the early 2000s due to a shift towards a high volume of smaller trades. The volume of extended-hours trades has grown rapidly as well; however, the shift in trade size has only recently appeared within the last few months of 2009. This shift is much too short-lived to make any assumption that a similar pattern is beginning to surface outside of trading hours.

A much more interesting trend appears when considering the price discovery process occurring during extended-hours trading as first investigated by Barclay and Hendershott (2003). They demonstrate that there is relatively low price discovery occurring outside of trading hours in the year 2000, even when only considering the largest 250 NASDAQ stocks by volume. However, the panel dataset I have created in this study allows me to look at the shifts in price discovery that have occurred in the past decade since Barclay and Hendershott's (2003) sample. As the financial world moves closer to a 24-hour trading day, the hours outside of 9:30 am to 4:00 pm on Monday-Friday have become increasingly important for the price discovery process. Information is released at all times of the trading day and what happens in the international stock markets has an increasingly large impact on stocks in the United States. Around the turn of the Twenty-First Century the price discovery taking place outside of trading hours made up only approximately 10% of the total price discovery for a 24-hour period. However, by the late 2000s this number has increased to over 30%, and even higher for large market capitalization stocks. I show that this result holds even after adjusting for the potential upward bias on the price discovery in non-trading hours that comes from using Barclay and Hendershott's (2003) Weighted Price Contribution measure. To adjust for this bias I use a newly created measure, the Absolute Price Discovery (APD), which allows price movements to count as positive price discovery for a time interval even if it is against the direction of the overall return for the 24-hour period. When using the APD measure the amount of price discovery occurring in extended-hours trading still shows a significant increase from 5.71% in 1999 to 25.28% in 2009. For S&P 500 large-cap stocks this increase is even greater, from 6.05% in 1999 to 41.09% in 2009.

My results clearly demonstrate the increased importance of non-trading hours as the United States financial markets become increasingly more a world market with a

24-hour trading period. While extended-hours trading has been mostly ignored in financial academic literature, I believe that the results of this study indicate that it deserves more attention in the future. In extensions of this paper I plan to look at the impact cross-listings have on the 24-hour price discovery process over time. I believe this will shed even more light on the shift in price discovery away from the prior concentration that occurred during the 9:30 am to 4:00 pm, Monday-Friday trading days.

Table 3-1. Average monthly extended-hours turnover by year. This table shows average monthly extended-hours turnover by year. Extended-hours turnover is calculated as total number of shares traded outside of trading hours for the month divided by the firm's total number of shares outstanding.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
S&P 1500 Composite	0.006%	0.012%	0.017%	0.022%	0.024%	0.023%	0.019%	0.022%	0.043%	0.040%	0.037%
S&P 500 Large-Cap	0.004%	0.007%	0.012%	0.018%	0.022%	0.017%	0.018%	0.024%	0.037%	0.038%	0.038%
S&P 400 Mid-Cap	0.007%	0.015%	0.017%	0.024%	0.024%	0.023%	0.019%	0.023%	0.039%	0.038%	0.036%
S&P 600 Small-Cap	0.010%	0.017%	0.024%	0.027%	0.027%	0.028%	0.021%	0.019%	0.052%	0.042%	0.037%

Table 3-2. Number of extended-hours trades per year and average extended-hours trade size. This table shows the volume of extended-hours trades occurring per year (in thousands) for the S&P 1500 as well as the average extended-hours trade size in both number of shares and dollar value.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Trades Per Year (In Thousands)	702	2377	2977	3871	4434	4901	4930	6000	7827	10518	18547
Average Trade Size (Number of Shares)	2,092	1,864	2,409	2,533	2,587	2,226	2,334	2,694	3,772	3,051	2,077
Average Trade Size (Dollar Value)	$138,663	$108,695	$82,028	$71,358	$76,607	$73,681	$84,055	$103,882	$147,544	$91,119	$40,964

Table 3-3. Average daily number of extended-hours trades by 30-minute interval. This table shows the average daily number of extended-hours trades occurring during each 30-minute interval for the S&P 1500.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Pre 7:00am	-	-	-	-	-	-	2.10	20.30	30.03	72.33	255.68
7am-7:30am	0.01	-	0.00	-	-	-	18.34	58.65	146.16	320.77	790.64
7:30am-8am	0.08	-	0.05	-	0.05	0.00	54.99	154.27	373.66	656.60	1,558.29
8am-8:30am	122.88	599.43	810.15	1,001.86	824.00	884.42	1,089.74	1,826.12	2,236.82	3,681.26	10,664.75
8:30am-9am	210.07	875.41	974.08	1,071.86	1,051.03	1,025.67	1,439.06	2,276.88	2,581.98	4,650.12	13,448.76
9am-9:30am	794.58	2,248.33	2,469.03	2,529.26	4,477.01	5,273.94	5,260.04	5,694.75	6,223.01	8,195.46	19,666.42
4pm-4:30pm	1,544.69	3,620.98	4,813.94	6,746.69	6,794.94	7,287.24	7,262.68	7,966.37	11,206.25	13,638.02	13,727.33
4:30pm-5pm	63.27	826.06	1,140.21	1,639.20	1,886.37	2,402.90	2,063.37	2,884.14	3,810.38	3,536.49	4,740.63
5pm-5:30pm	26.73	556.42	886.68	1,085.56	1,305.96	1,482.96	1,040.33	1,370.98	1,969.30	1,904.56	2,790.44
5:30pm-6pm	12.90	397.41	549.57	813.15	806.00	688.28	644.71	813.84	1,097.09	1,432.85	1,679.48
6pm-6:30pm	10.32	305.68	359.57	467.90	405.33	366.24	605.02	661.69	688.89	805.92	1,439.79
6:30pm-7pm	0.00	1.20	0.22	3.64	20.16	14.98	45.10	94.24	379.35	562.66	1,040.94
Post 7:00pm	-	-	-	3.65	22.90	20.69	36.47	84.00	439.67	2,116.05	1,795.91

Table 3-4. Percentage of extended-hours trades occurring by venue. This table shows the percentage of extended-hours trades occurring by venue for the S&P 1500.

Venue	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
NASDAQ	99.80%	99.46%	98.78%	78.06%	63.46%	41.75%	38.17%	60.34%	66.19%	62.14%	53.15%
ARCA	0.01%	0.10%	0.22%	0.69%	15.01%	26.10%	30.92%	37.21%	29.61%	32.77%	40.31%
NSX	0.00%	0.00%	0.00%	20.51%	20.97%	29.43%	30.68%	2.28%	0.28%	0.35%	0.02%
NYSE	0.02%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	0.02%	3.83%	3.57%	0.84%
AMEX	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
Boston	0.00%	0.08%	0.27%	0.36%	0.25%	2.51%	0.08%	0.05%	0.01%	0.00%	0.29%
ISE	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.91%	1.03%
Chicago	0.14%	0.30%	0.53%	0.34%	0.26%	0.15%	0.13%	0.09%	0.05%	0.02%	0.01%
CBOE	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.01%
Philadelphia	0.03%	0.05%	0.20%	0.04%	0.06%	0.05%	0.02%	0.00%	0.01%	0.00%	0.00%
BATS	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.21%	4.34%

Table 3-5. Weighted Price Contribution by year. This table shows the Weighted Price Contribution for each time interval by year. The Weighted Price Contribution is calculated as:

$$\mathrm{WPC_i} = \sum_{s=1}^{S}\left(\frac{|\mathrm{ret_s}|}{\sum_{s=1}^{S}|\mathrm{ret_s}|}\right) * \left(\frac{\mathrm{ret_{i,s}}}{\mathrm{ret_s}}\right)$$

where $ret_{i,s}$ is the logarithmic return for stock *s* during period *i* and ret_s is the close-to-close return for stock *s*. Days with zero price change are discarded.

	Time Interval	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Whole Sample	Post-Close	0.36%	0.60%	1.00%	1.05%	1.32%	1.54%	1.51%	1.33%	2.24%	1.55%	1.36%
	Overnight	0.00%	0.01%	0.01%	0.49%	2.25%	1.57%	2.81%	5.45%	11.43%	12.29%	14.87%
	Pre-Open	8.13%	12.00%	13.93%	14.99%	19.60%	20.77%	18.85%	20.88%	21.02%	16.89%	16.12%
	Trading Hours	91.51%	87.39%	85.06%	83.47%	76.83%	76.13%	76.83%	72.34%	65.31%	69.27%	67.65%
S&P 500 Large-Cap	Post-Close	0.23%	0.85%	1.49%	1.78%	1.66%	1.93%	1.87%	2.04%	2.48%	1.52%	1.93%
	Overnight	0.01%	0.02%	0.04%	1.25%	6.34%	4.54%	7.86%	14.04%	22.00%	27.70%	33.12%
	Pre-Open	9.88%	13.38%	15.05%	15.44%	20.38%	21.26%	23.37%	30.04%	23.61%	23.11%	22.47%
	Trading Hours	89.89%	85.75%	83.42%	81.53%	71.62%	72.27%	66.90%	53.89%	51.91%	47.67%	42.48%
S&P 400 Mid-Cap	Post-Close	0.19%	0.40%	0.80%	0.53%	1.04%	1.29%	1.23%	0.91%	1.92%	1.30%	1.28%
	Overnight	0.00%	0.00%	0.00%	0.04%	0.51%	0.45%	1.07%	2.65%	8.41%	8.63%	10.22%
	Pre-Open	6.21%	10.14%	13.26%	14.09%	17.07%	18.74%	17.22%	20.53%	19.10%	15.97%	16.08%
	Trading Hours	93.60%	89.46%	85.94%	85.33%	81.39%	79.53%	80.48%	75.91%	70.57%	74.10%	72.42%
S&P 600 Small-Cap	Post-Close	0.36%	0.60%	1.00%	1.05%	1.32%	1.54%	1.51%	1.33%	2.24%	1.55%	1.36%
	Overnight	0.00%	0.01%	0.01%	0.49%	2.25%	1.57%	2.81%	5.45%	11.43%	12.29%	14.87%
	Pre-Open	8.13%	12.00%	13.93%	14.99%	19.60%	20.77%	18.85%	20.88%	21.02%	16.89%	16.12%
	Trading Hours	91.51%	87.39%	85.06%	83.47%	76.83%	76.13%	76.83%	72.34%	65.31%	69.27%	67.65%

Table 3-6. Absolute Price Discovery by year. This table shows the Absolute Price Discovery for each time interval by year. The Absolute Price Discovery is calculated as

$$\mathrm{APD_i} = \sum_{\mathrm{s=1}}^{\mathrm{S}} \frac{\left(\mathrm{ret_{i,s}}\right)^2}{\sum_{\mathrm{i=1}}^{\mathrm{I}}\left(\mathrm{ret_{i,s}}\right)^2}$$

where $ret_{i,s}$ is the logarithmic return for stock *s* during period *i*.

	Time Interval	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Whole Sample	Post-Close	1.14%	1.96%	2.91%	2.96%	4.56%	5.10%	7.13%	9.07%	9.52%	5.38%	4.68%
	Overnight	0.00%	0.01%	0.01%	0.19%	1.03%	0.80%	1.45%	2.60%	6.40%	6.85%	7.80%
	Pre-Open	4.57%	6.43%	7.04%	8.57%	11.31%	12.05%	11.96%	14.45%	15.31%	12.14%	12.80%
	Trading Hours	94.29%	91.61%	90.05%	88.27%	83.11%	82.05%	79.46%	73.88%	68.78%	75.64%	74.72%
S&P 500 Large-Cap	Post-Close	0.65%	2.89%	5.14%	5.44%	7.06%	6.25%	9.43%	11.23%	9.76%	4.55%	5.17%
	Overnight	0.01%	0.01%	0.02%	0.48%	2.66%	2.03%	3.66%	6.20%	11.49%	14.59%	16.25%
	Pre-Open	5.39%	6.82%	7.27%	8.81%	11.94%	12.70%	15.80%	21.43%	18.89%	18.00%	19.66%
	Trading Hours	93.95%	90.28%	87.57%	85.27%	78.35%	79.02%	71.11%	61.14%	59.86%	62.86%	58.91%
S&P 400 Mid-Cap	Post-Close	0.82%	1.09%	1.14%	0.57%	2.61%	4.09%	6.93%	9.92%	9.28%	3.64%	4.01%
	Overnight	0.00%	0.00%	0.00%	0.02%	0.14%	0.15%	0.40%	0.89%	4.11%	4.10%	4.47%
	Pre-Open	3.62%	5.81%	6.83%	8.11%	9.62%	10.31%	9.79%	12.37%	13.01%	10.24%	10.85%
	Trading Hours	95.56%	93.10%	92.03%	91.31%	87.63%	85.45%	82.87%	76.83%	73.61%	82.01%	80.67%
S&P 600 Small-Cap	Post-Close	2.03%	1.62%	1.90%	2.22%	3.46%	4.71%	5.07%	6.43%	9.43%	7.27%	4.72%
	Overnight	0.00%	0.00%	0.00%	0.02%	0.04%	0.07%	0.12%	0.46%	3.44%	2.19%	2.74%
	Pre-Open	4.38%	6.47%	6.96%	8.69%	11.95%	12.74%	9.93%	9.42%	13.70%	8.48%	8.19%
	Trading Hours	93.59%	91.91%	91.14%	89.07%	84.54%	82.48%	84.89%	83.69%	73.43%	82.06%	84.34%

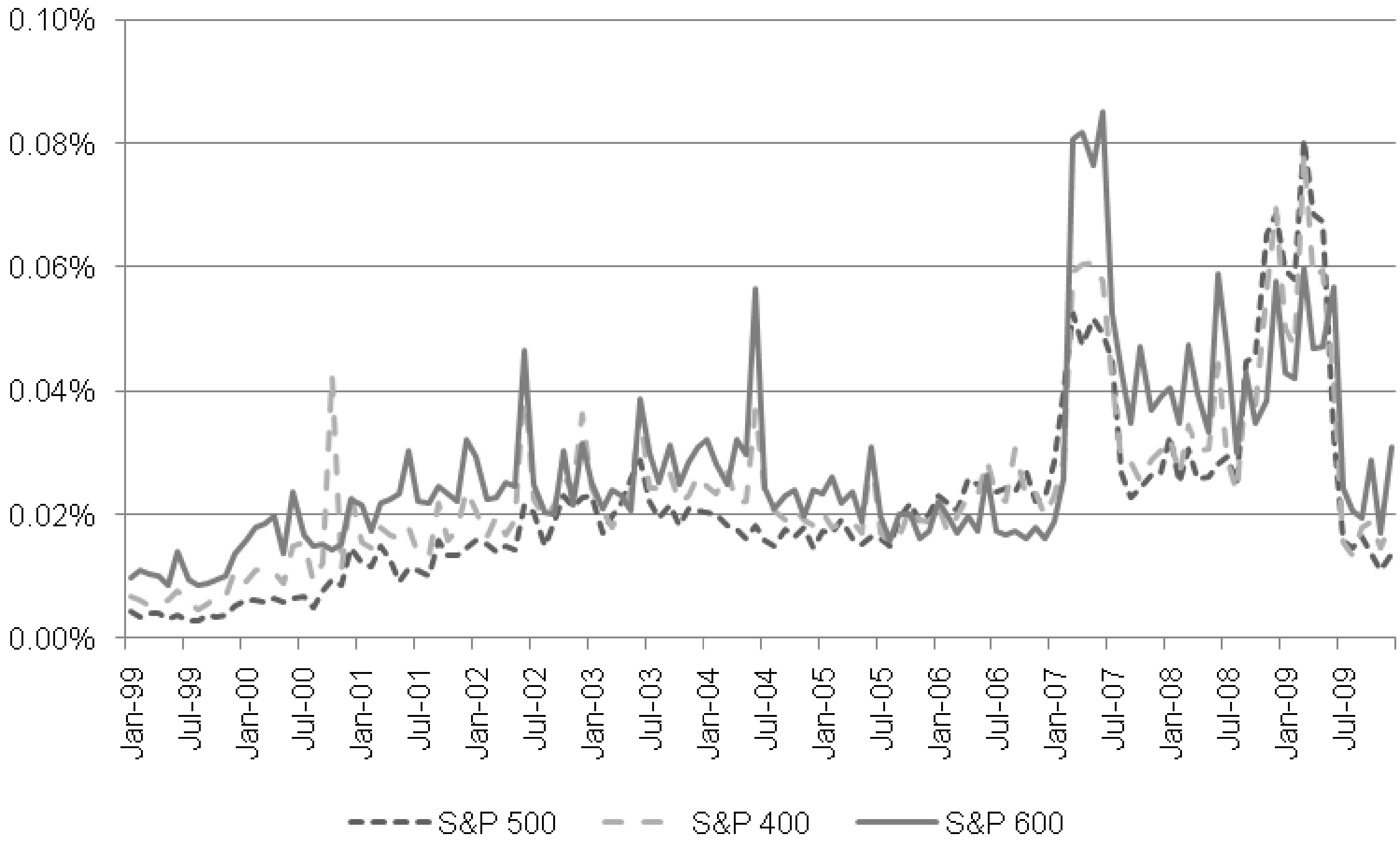

Figure 3-1. Turnover by month for the S&P 500, S&P 400 and S&P 600. This figure shows the average monthly extended-hours turnover by stock for the S&P 500, S&P 400 and S&P 600 across time. Extended-hours turnover is calculated as total number of shares traded outside of trading hours for the month divided by the firm's total number of shares outstanding.

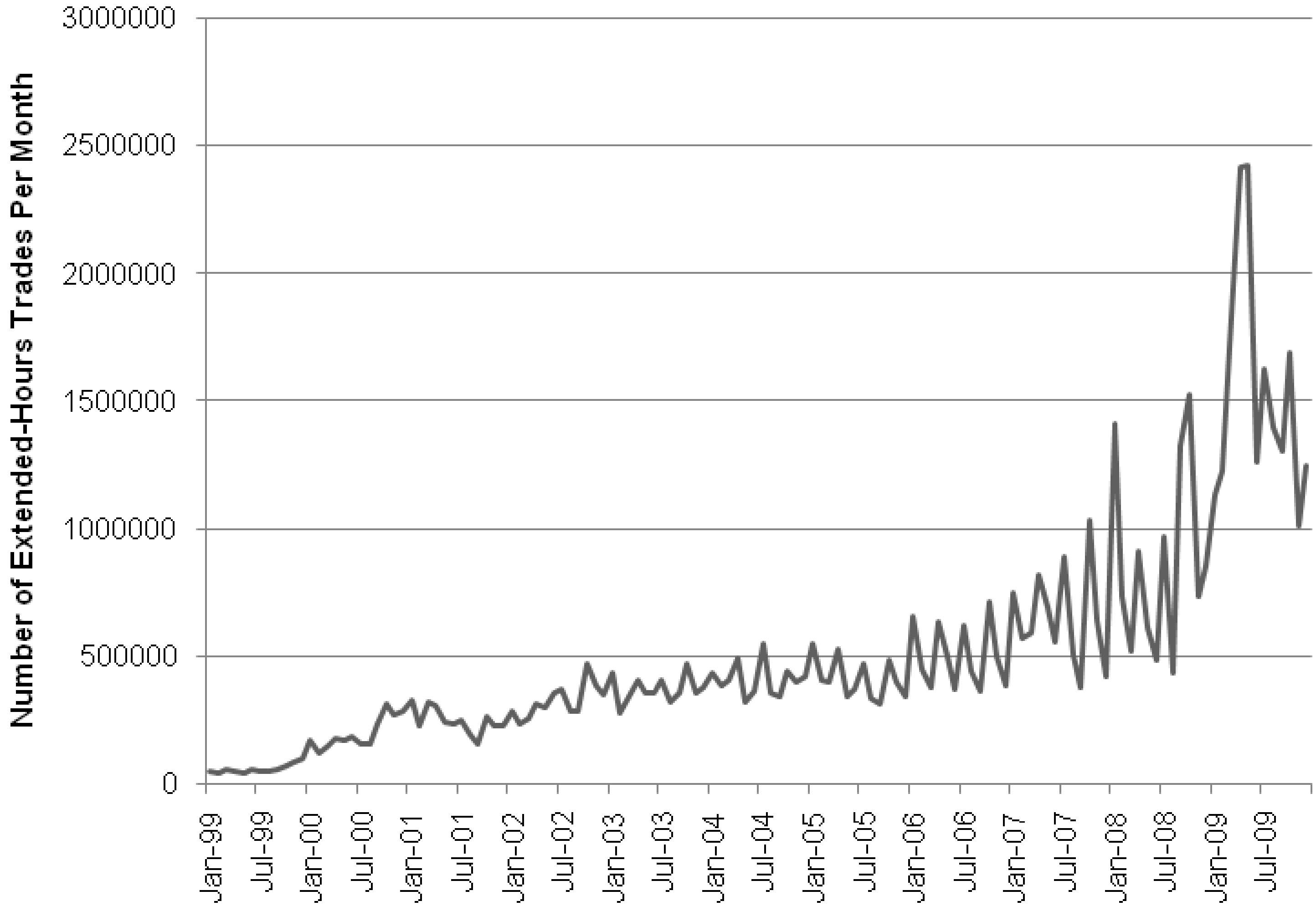

Figure 3-2. Number of extended-hours trades by month. This chart shows the number of extended-hours trades per month across time.

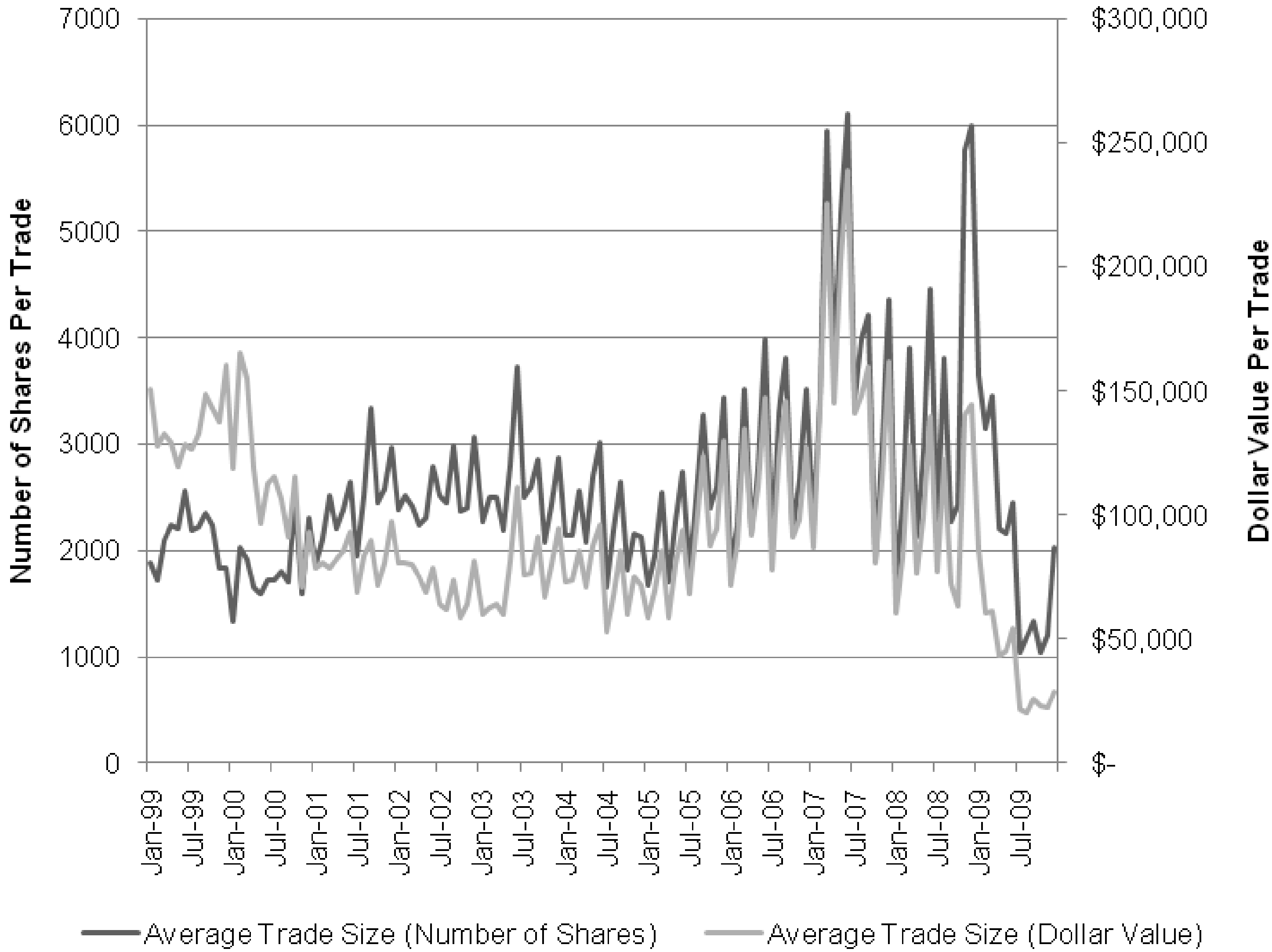

Figure 3-3. Size of extended-hours trades by month. This chart shows the size of extended-hours trades per month across time. The average size is calculated both as the average number of shares per trade and the average dollar value per trade.

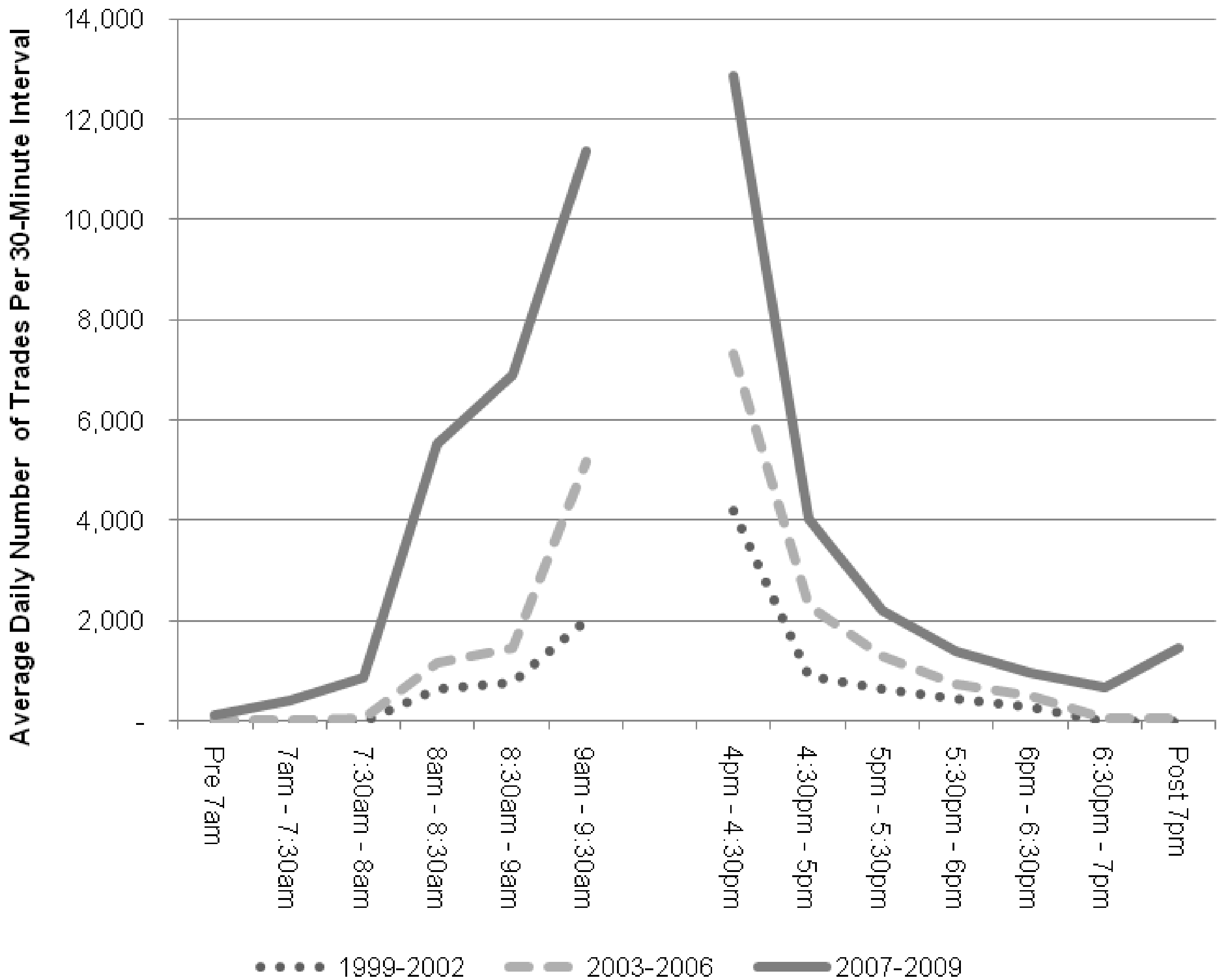

Figure 3-4. Number of extended-hours trades by 30-minute interval. This chart shows the number of extended-hours trades per 30-minute interval broken into three time segments. The dotted line represents the years 1999 through 2002, the dashed line represents the years 2003 through 2006, and the solid line represents the years 2007 through 2009.

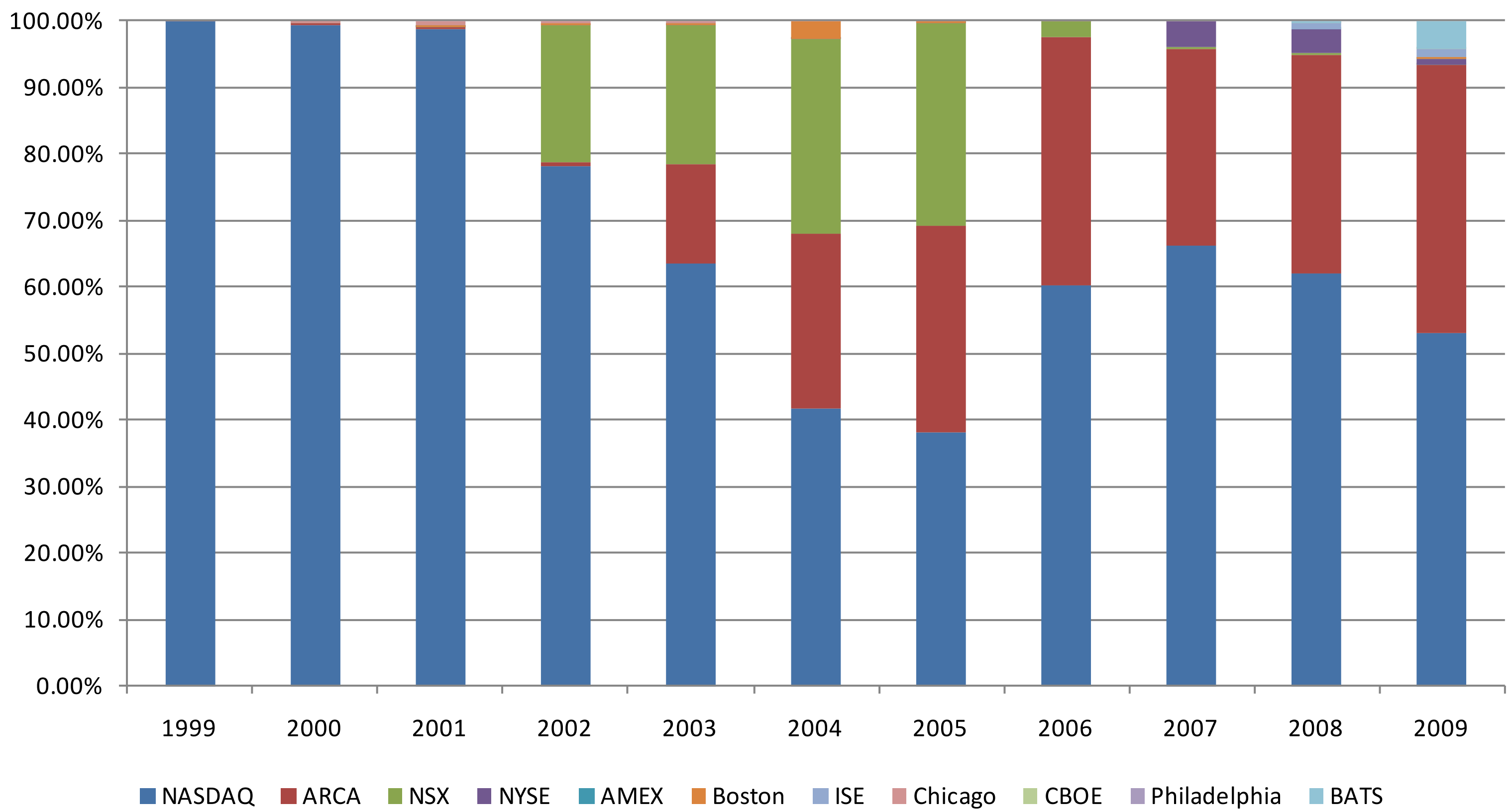

Figure 3-5. Percentage of extended-hours trades by venue. This chart shows the percentage of extended-hours trades by interval across time.

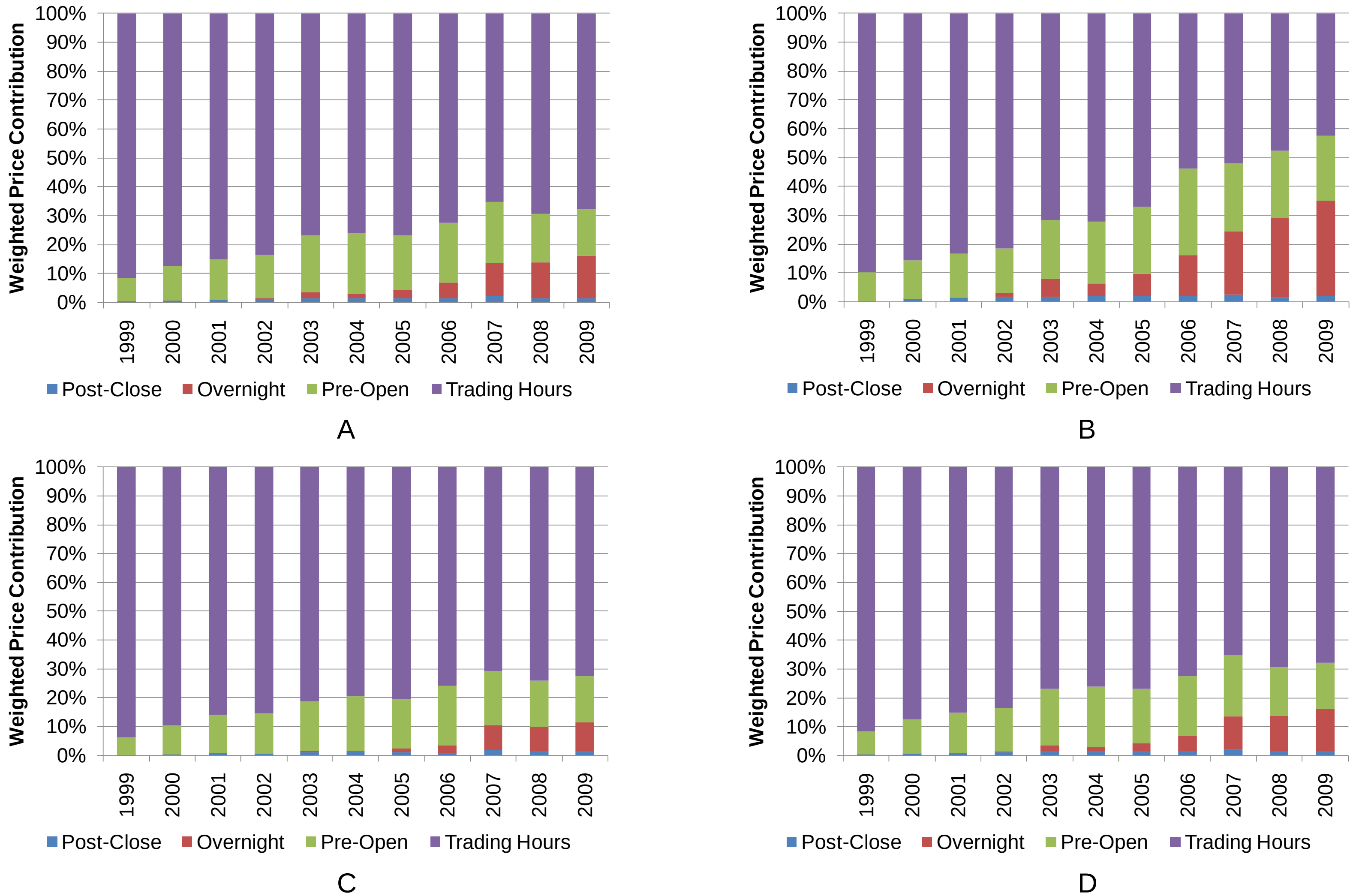

Figure 3-6. Weighted Price Contribution by year. These charts demonstrate the relative Weighted Price Contribution that occurs during the post-close, overnight, pre-open and trading hours intervals by year. A) Firms in the S&P 1500 Composite Index. B) Firms in the S&P 500 Large-Cap Index. C) Firms in the S&P 400 Mid-Cap Index. D) Firms in the S&P600 Small-Cap Index.

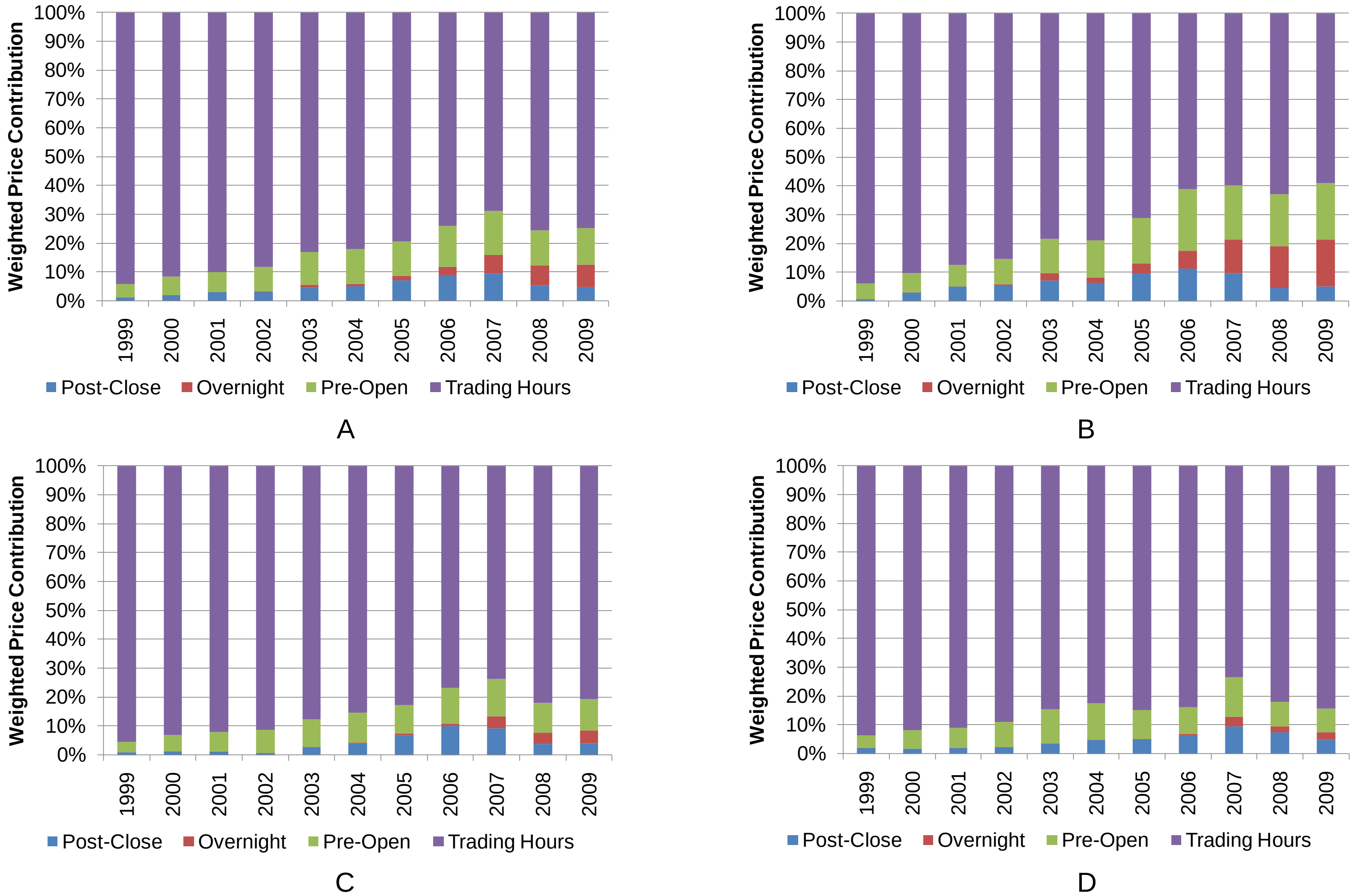

Figure 3-7. Absolute Price Discovery by year. These charts demonstrate the relative Absolute Price Discovery that occurs during the post-close, overnight, pre-open and trading hours intervals by year. A) Firms in the S&P 1500 Composite Index. B) Firms in the S&P 500 Large-Cap Index. C) Firms in the S&P 400 Mid-Cap Index. D) Firms in the S&P600 Small-Cap Index.

CHAPTER 4
CONCLUSION AND FUTURE WORK

In this study I focus on two separate topics in the finance literature: payout policy and extended-hours trading. The first part of the study, Chapter 2, looks at the impact of market-level uncertainty on a firm's payout policy decision. To proxy for uncertainty I utilize the Chicago Board Options Exchange Volatility Index (VIX). I demonstrate that, even after controlling for a wide range of firm-level determinants of payout policy from prior literature, the VIX has a significant impact on the payout policy decision firms make. This impact differs based on the firm's relative cash flow level and the type of payout (dividend or repurchase). Firms with low levels of cash flow are forced to take a more conservative approach to dividend payouts. Despite the fact that firms are very reluctant to decrease dividends due to the negative signal associated with a decrease, low cash flow firms become significantly more likely to decrease dividend levels during high VIX periods.[1] However, firms with relatively high levels of cash flow are better able to sustain current dividend levels throughout the period of volatility.

On the other hand, a different pattern appears when looking at the repurchase choice. Repurchases are not viewed as "sticky" as dividends are. Instead repurchase decisions are looked at as more of a one-time way to return cash to stockholders. Therefore I find that firms with high levels of cash flow actually utilize repurchases as a way to opportunistically take advantage of high volatility periods. I show that these high cash flow firms have an increased propensity to initiate a dividend repurchase when the

[1] The "dividend stickiness" story of Lintner (1956) demonstrates that firms try to avoid dividend decreases as this is associated with a stock price penalty given investors interpret the decrease as a negative signal for future earnings.

VIX is high. It appears that they are using the high volatility in stock prices to try and time repurchases when their stock price is low.

In the second part of the study, Chapter 3, I turn the focus to extended-hours trading. Despite being a mostly overlooked area in the academic finance literature, I show that the non-trading hours have become an increasingly important part of the price discovery process for stocks. Since non-institutional investors were first given access to trading outside of the normal 9:30 am to 4:00 pm trading day the percentage of price discovery taking place in these non-regular trading hours has grown significantly. I demonstrate this using both a previously established measure of price discovery, the Weighted Price Contribution (WPC), and my own measure of price discovery, the Absolute Price Discovery (APD). Using the WPC measure utilized in Barclay and Hendershott (2003) I find that the percentage of price discovery occurring in extended-hours trading for firms in the S&P 1500 has increased from 8.49% in 1999 to 32.35% in 2009. However, the WPC may be upwardly-biased if you consider any price movement during a time interval to be positive price discovery. Therefore, I also utilize my newly created APD measure to attempt to eliminate this bias. Using the APD measure I still find a significant increase in price discovery from 5.71% in 1999 to 25.28% in 2009. The increase in price discovery is even more significant for the large-capitalization stocks in the S&P 500, as it changes from 10.11% in 1999 to 57.52% in 2009 utilizing the WPC (6.05% to 41.09% using the APD).

I also look at trends in the volume and size of extended-hours trades that have occurred since 1999. Chordia, Roll and Subrahmanyam (2011) show that there has been a shift towards a higher volume of smaller trades in regular trading hours during their sample period (1993 to 2008). While I find that there has been an increase in the volume of trades occurring outside of trading hours, I do not necessarily find the size of the average trade has decreased as they demonstrate. Therefore, it does not seem as though the same trends have necessarily transferred to extended-hour trading.

In extensions of this study I plan to further investigate the causes for the shift in price discovery. By determining cross-listings of the firms in my sample and linking each firm to the hours of the day which the firm is traded on any exchange I will be able to better identify the impact of cross-listings on extended-hours price discovery. I also plan to attempt to identify the effect the recent financial crisis may have had on the impact of international stock movements on the movements of stocks trading at the U.S. exchanges. I believe that extended-hours trading is an area of the financial literature which still has a lot to be revealed. I plan to continue work in this area and try to help further develop the literature on extended-hours trading.

APPENDIX
GARCH (1,1) ESTIMATE OF THE VIX

To allow the extension of my dataset to include pre-1990 data I construct a GARCH (1,1) estimate of the VIX dating back to 1962. Prior literature, such as Engle (2001) and Hao and Zhang (2010), show that a GARCH (1,1) estimate of volatility for the S&P 500 is a good proxy for the VIX. Utilizing S&P 500 daily logarithmic returns I use GARCH (1,1) methodology to calculate a fitted model of:

$$y_t = 0.0006196 + \varepsilon_t \tag{A-1}$$

$$\sigma_t^2 = 0.0763073 * \varepsilon_{t-1}^2 + 0.1976602 * \sigma_{t-1}^2 \tag{A-2}$$

where y_t is the actual logarithmic return for day ***t***, ε_t is the error in the estimate for day ***t***, σ_t^2 is the GARCH estimate of volatility for day ***t***, ε_{t-1}^2 is the actual error from the estimate for day ***t-1***, and σ_{t-1}^2 is the actual GARCH estimate of volatility from day ***t-1***. For each day, the GARCH estimate σ_t^2 is calculated using the actual estimate and error from the prior day's GARCH estimate. For the first day of the sample ε_{t-1}^2 is assumed to be 0 and σ_{t-1}^2 is the actual variance over the entire sample period. The GARCH measure calculated using this methodology results in an estimate that has a correlation with the VIX of approximately 0.913. This correlation is in line with prior research, such as Hao and Zhang (2010) who find a correlation of approximately 0.92. Results from tests run on the GARCH sample are shown in Table A-1 through Table A-12.

Table A-1. Logit regression for the choice to pay or not pay a dividend. This table shows the logit regression coefficients for the firm's choice to either pay or not pay a dividend. A firm is considered to have a positive dividend if the ex-date dividend per share (Compustat Item #26) is positive. Standard errors are shown in parenthesis. Base choice is to not pay a dividend.

Variable	Whole Sample		1962-1989		1990-2009	
NYP	2.689 (0.18)	***	3.635 (0.13)	***	2.297 (0.20)	***
MtoB	-0.609 (0.06)	***	-0.701 (0.06)	***	-0.287 (0.03)	***
dA/A	-0.694 (0.06)	***	-0.647 (0.08)	***	-0.938 (0.07)	***
E/A	2.156 (0.58)	***	1.867 (0.68)	***	0.370 (0.29)	
GARCH	-0.046 (0.01)	***	-0.042 (0.02)	**	-0.031 (0.01)	***
ReturnVolatility	-0.041 (0.00)	***	-0.046 (0.00)	***	-0.042 (0.00)	***
CashFlow/Assets	4.825 (0.43)	***	5.185 (0.52)	***	3.913 (0.47)	***
LagNetDebt/Assets	-0.420 0.099	***	-1.123 0.183	***	-0.091 0.110	
NegativeRetainedEarn	-1.522 (0.08)	***	-1.536 (0.13)	***	-1.366 (0.04)	***
ChangeDivTaxRate	-0.089 (0.02)	***	-0.018 (0.02)		0.087 (0.62)	
RepatTaxCutDummy	-0.802 (0.14)	***			-0.234 (0.11)	**
LagReturn	-0.019 (0.01)	**	-0.008 (0.01)		-0.054 (0.01)	***

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-1 Continued

Variable	Whole Sample		1962-1989		1990-2009	
CFQuart2*GARCH	0.013	*	0.020		0.023	*
	(0.01)		(0.01)		(0.01)	
CFQuart3*GARCH	0.005		0.012		0.021	*
	(0.01)		(0.01)		(0.01)	
CFQuart4*GARCH	0.003		0.002		0.023	*
	(0.01)		(0.01)		(0.01)	
CFQuart2*ReturnVol	-0.004	*	-0.003		-0.005	*
	(0.00)		(0.00)		(0.00)	
CFQuart3*ReturnVol	-0.000		0.003		-0.006	**
	(0.00)		(0.00)		(0.00)	
CFQuart4*ReturnVol	0.001		0.003		-0.008	**
	(0.00)		(0.00)		(0.00)	
Constant	2.650	***	2.371	***	2.296	***
	(0.28)		(0.37)		(0.33)	
Industry Dummies	Y		Y		Y	
Year Clustered S.E.	Y		Y		Y	
Number of observations	118,968		56,441		62,404	
Adjusted R2	0.412		0.423		0.394	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-2. Linear combination for the choice to pay or not pay a dividend. This table shows the linear combination of coefficients for the interaction variables from Table A-1 for the firm's choice to either pay or not pay a dividend. A firm is considered to have a positive dividend if the ex-date dividend per share (Compustat Item #26) is positive. Standard errors are shown in parenthesis. Base choice is to not pay a dividend.

Variable	Whole Sample		1962-1989		1990-2009	
GARCH	-0.046	***	-0.042	**	-0.031	***
	(0.01)		(0.02)		(0.01)	
GARCH + CFQuart2*GARCH	-0.034	**	-0.022		-0.008	
	(0.02)		(0.02)		(0.01)	
GARCH + CFQuart3*GARCH	-0.042	***	-0.030		-0.011	
	(0.02)		(0.02)		(0.01)	
GARCH + CFQuart4*GARCH	-0.044	**	-0.040	**	-0.009	
	(0.02)		(0.02)		(0.01)	
ReturnVolatility	-0.041	***	-0.046	***	-0.042	***
	(0.00)		(0.00)		(0.00)	
ReturnVolatility+ CFQuart2*ReturnVol	-0.045	***	-0.049	***	-0.047	***
	(0.00)		(0.00)		(0.00)	
ReturnVolatility + CFQuart3*ReturnVol	-0.041	***	-0.042	***	-0.048	***
	(0.00)		(0.00)		(0.00)	
ReturnVolatility + CFQuart4*ReturnVol	-0.040	***	-0.043	***	-0.050	***
	0.004		0.004		0.004	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-3. Multinomial logit regression for the choice to maintain or change dividend for prior dividend payers. This table shows the multinomial logit regression for the firm's choice to either maintain or change their dividend given that they paid a dividend during the prior fiscal year. The firm's dividend is measured using the ex-date dividends per share for the fiscal year (Compustat Item #26). Standard errors are shown in parenthesis. Base choice is to maintain dividend level.

Variable	Decrease Dividend		Increase Dividend		Decrease Dividend		Increase Dividend		Decrease Dividend		Increase Dividend	
	Whole Sample				1962-1989				1990-2009			
NYP	-1.295	***	0.558	***	-1.474	***	0.567	***	-1.207	***	0.611	***
	(0.16)		(0.09)		(0.10)		(0.11)		(0.23)		(0.09)	
MtoB	0.146	**	-0.180	***	0.011		-0.302	***	0.290	***	0.136	***
	(0.06)		(0.07)		(0.09)		(0.11)		(0.07)		(0.05)	
dA/A	-1.160	***	1.251	***	-1.570	***	1.567	***	-0.455	**	0.725	***
	(0.15)		(0.11)		(0.20)		(0.15)		(0.18)		(0.11)	
E/A	-2.286	***	10.257	***	-3.928	***	14.262	***	-1.800	***	4.257	***
	(0.51)		(1.14)		(0.81)		(1.60)		(0.43)		(1.02)	
GARCH	0.029	***	-0.033	*	0.041	**	-0.009		0.035	***	-0.054	**
	(0.01)		(0.02)		(0.02)		(0.03)		(0.01)		(0.02)	
ReturnVolatility	0.028	***	0.013	***	0.018	***	0.012	**	0.036	***	0.013	**
	(0.00)		(0.00)		(0.00)		(0.01)		(0.01)		(0.01)	
CashFlow/Assets	-4.381	***	2.568	***	-4.975	***	2.179	***	-1.791	**	2.502	***
	(0.83)		(0.62)		(1.05)		(0.74)		(0.85)		(0.88)	
LagNetDebt/Assets	0.784	***	-0.474	***	1.094	***	-0.195	*	0.421	*	-0.817	***
	(0.15)		(0.08)		(0.17)		(0.10)		(0.25)		(0.10)	
NegativeRetainedEarn	0.526	***	-0.431	***	0.587	***	-0.251		0.598	***	-0.349	***
	(0.07)		(0.10)		(0.13)		(0.15)		(0.07)		(0.11)	
ChangeDivTaxRate	0.001		-0.005		0.000		-0.018		2.682	***	-0.044	
	(0.01)		(0.01)		(0.01)		(0.02)		(0.39)		(0.42)	
RepatTaxCutDummy	-0.395	**	0.319	**					-0.230		0.237	**
	(0.19)		(0.13)						(0.15)		(0.11)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-3 Continued

Variable	Decrease Dividend		Increase Dividend		Decrease Dividend		Increase Dividend		Decrease Dividend		Increase Dividend	
	Whole Sample				1962-1989				1990-2009			
LagReturn	-0.095	***	0.034	**	-0.022	*	0.018		-0.631	***	0.238	***
	(0.03)		(0.02)		(0.01)		(0.01)		(0.07)		(0.04)	
CFQuart2*GARCH	-0.033	***	0.004		-0.060	***	-0.008		-0.024	*	0.024	
	(0.01)		(0.01)		(0.01)		(0.01)		(0.01)		(0.02)	
CFQuart3*GARCH	-0.055	***	0.017		-0.074	***	0.021		-0.049	**	0.038	**
	(0.02)		(0.01)		(0.02)		(0.01)		(0.02)		(0.02)	
CFQuart4*GARCH	-0.018		0.030	**	-0.011		0.048	**	-0.040	**	0.031	**
	(0.01)		(0.01)		(0.03)		(0.02)		(0.02)		(0.02)	
CFQuart2*ReturnVol	-0.002		-0.010	**	0.007	*	0.000		-0.005		-0.024	***
	(0.00)		(0.00)		(0.00)		(0.00)		(0.01)		(0.01)	
CFQuart3*ReturnVol	-0.002		-0.008	**	0.008		-0.003		-0.008		-0.023	***
	(0.00)		(0.00)		(0.01)		(0.00)		(0.01)		(0.01)	
CFQuart4*ReturnVol	-0.001		-0.006		0.006		-0.007		-0.007		-0.014	**
	(0.00)		(0.00)		(0.01)		(0.01)		(0.01)		(0.01)	
Constant	-0.726	**	-0.847	***	0.335		-1.379	***	-2.159	***	-0.528	
	(0.36)		(0.27)		(0.37)		(0.45)		(0.45)		(0.34)	
Industry Dummies	Y		Y		Y		Y		Y		Y	
Year Clustered S.E.	Y		Y		Y		Y		Y		Y	
Number of observations	52,347		52,347		33,592		33,592		18,755		18,755	
Adjusted R2	0.161		0.161		0.179		0.179		0.157		0.157	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-4. Linear combination for the choice to maintain or change dividend for prior dividend payers. This table shows the linear combination of coefficients for the interaction variables from Table A-3 for the firm's choice to either maintain or change their dividend given that they paid a dividend during the prior fiscal year. The firm's dividend is measured using the ex-date dividends per share for the fiscal year (Compustat Item #26). Standard errors are shown in parenthesis. Base choice is to maintain dividend level.

Variable	Decrease Dividend		Increase Dividend		Decrease Dividend		Increase Dividend		Decrease Dividend		Increase Dividend	
	Whole Sample				1962-1989				1990-2009			
GARCH	0.029	***	-0.033	*	0.041	**	-0.009		0.035	***	-0.054	**
	(0.01)		(0.02)		(0.02)		(0.03)		(0.01)		(0.02)	
GARCH + CFQuart2*VIX	-0.004		-0.028	*	-0.019		-0.017		0.011		-0.030	*
	(0.01)		(0.02)		(0.01)		(0.03)		(0.01)		(0.02)	
GARCH + CFQuart3*VIX	-0.027		-0.016		-0.032	**	0.012		-0.014		-0.016	
	(0.02)		(0.02)		(0.02)		(0.03)		(0.02)		(0.01)	
GARCH + CFQuart4*VIX	0.011		-0.003		0.031	*	0.039		-0.005		-0.023	
	(0.01)		(0.02)		(0.02)		(0.03)		(0.01)		(0.01)	
ReturnVolatility	0.028	***	0.013	***	0.018	***	0.012	**	0.036	***	0.013	**
	(0.00)		(0.00)		(0.00)		(0.01)		(0.01)		(0.01)	
ReturnVolatility+ CFQuart2*ReturnVol	0.027	***	0.003		0.025	***	0.012	***	0.031	***	-0.011	***
	(0.00)		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)	
ReturnVolatility + CFQuart3*ReturnVol	0.026	***	0.005	*	0.026	***	0.008	**	0.028	***	-0.010	***
	(0.00)		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)	
ReturnVolatility + CFQuart4*ReturnVol	0.028	***	0.008	***	0.024	***	0.005		0.029	***	-0.001	
	(0.00)		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-5. Logit regression for the choice to maintain or pay a dividend for prior dividend non-payers. This table shows the logit regression for the firm's choice to either maintain or change their dividend given that they did not pay a dividend during the prior fiscal year. The firm's dividend is measured using the ex-date dividends per share for the fiscal year (Compustat Item #26). Standard errors are shown in parenthesis. Base choice is to maintain no dividend.

Variable	Whole Sample		1962-1989		1990-2009	
NYP	1.003	***	1.462	***	1.054	***
	(0.14)		(0.18)		(0.16)	
MtoB	-0.594	***	-0.897	***	-0.234	***
	(0.14)		(0.13)		(0.06)	
dA/A	-0.571	***	-0.319		-1.189	***
	(0.16)		(0.13)		(0.33)	
E/A	4.827	***	3.974	***	4.211	***
	(0.71)		(1.05)		(0.94)	
GARCH	-0.056	**	-0.037		-0.069	***
	(0.02)		(0.03)		(0.02)	
ReturnVolatility	-0.010	***	-0.015	***	-0.007	
	(0.00)		(0.00)		(0.00)	
CashFlow/Assets	1.917	**	3.448	***	0.916	
	(0.95)		(0.86)		(1.24)	
LagNetDebt/Assets	-0.969	***	-1.182	***	-1.022	***
	(0.11)		(0.13)		(0.19)	
NegativeRetainedEarn	-0.807	***	-0.988	***	-0.543	***
	(0.13)		(0.19)		(0.15)	
ChangeDivTaxRate	-0.030		0.045		-5.176	***
	(0.04)		(0.03)		(0.58)	
RepatTaxCutDummy	-0.079				0.233	
	(0.29)				(0.30)	
LagReturn	0.008		-0.001		0.028	**
	(0.01)		(0.01)		(0.01)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-5 Continued

Variable	Whole Sample		1962-1989		1990-2009
CFQuart2*GARCH	0.004		-0.008		0.015
	(0.01)		(0.02)		(0.02)
CFQuart3*GARCH	0.005		0.001		0.018
	(0.01)		(0.01)		(0.02)
CFQuart4*GARCH	0.016		0.018		0.008
	(0.01)		(0.02)		(0.02)
CFQuart2*ReturnVol	0.001		0.008	*	-0.006
	(0.00)		(0.00)		(0.01)
CFQuart3*ReturnVol	0.006	*	0.013	***	-0.002
	(0.00)		(0.00)		(0.00)
CFQuart4*ReturnVol	0.008	**	0.009	**	0.003
	(0.00)		(0.00)		(0.01)
Constant	-1.034	**	-1.253	*	-1.183
	(0.45)		(0.67)		(0.54)
Industry Dummies	Y		Y		Y
Year Clustered S.E.	Y		Y		Y
Number of observations	66,595		22,842		43,608
Adjusted R2	0.131		0.153		0.116

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-6. Linear combination for the choice to maintain or pay a dividend for prior dividend non-payers. This table shows the linear combination of coefficients for the interaction variables from Table A-5 for the firm's choice to either maintain or change their dividend given that they did not pay a dividend during the prior fiscal year. The firm's dividend is measured using the ex-date dividends per share for the fiscal year (Compustat Item #26). Standard errors are shown in parenthesis. Base choice is to maintain no dividend.

Variable	Whole Sample		1962-1989		1990-2009	
GARCH	-0.056	**	-0.037		-0.069	***
	(0.02)		(0.03)		(0.02)	
GARCH + CFQuart2*GARCH	-0.051	**	-0.045		-0.054	***
	(0.02)		(0.03)		(0.02)	
GARCH + CFQuart3*GARCH	-0.050	**	-0.036		-0.051	***
	(0.02)		(0.03)		(0.01)	
GARCH + CFQuart4*GARCH	-0.040	*	-0.018		-0.061	***
	(0.02)		(0.02)		(0.01)	
ReturnVolatility	-0.010	***	-0.015	***	-0.007	
	(0.00)		(0.00)		(0.00)	
ReturnVolatility+ CFQuart2*ReturnVol	-0.009	***	-0.007	*	-0.013	**
	(0.00)		(0.00)		(0.01)	
ReturnVolatility + CFQuart3*ReturnVol	-0.004		-0.002		-0.009	***
	(0.00)		(0.00)		(0.00)	
ReturnVolatility + CFQuart4*ReturnVol	-0.002		-0.006	**	-0.004	
	(0.00)		(0.00)		(0.00)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-7. Logit regression for the choice to repurchase shares or not repurchase shares. This table shows the logit regression and linear combination for interaction coefficients for the firm's choice to either repurchase shares or not repurchase shares. A firm is considered to be a repurchaser if total repurchases are positive, where total purchases are defined as purchase of common and preferred stock (Compustat Item #115) plus the minimum of 0 and (preferred stock / redemption value (Compustat Item #56) minus lag(preferred stock / redemption value). Standard errors are shown in parenthesis. Base choice is to not repurchase shares.

Variable	Whole Sample		1962-1989		1990-2009	
NYP	0.385	**	-0.094		0.852	***
	(0.16)		(0.16)		(0.21)	
MtoB	-0.146	***	-0.346	***	-0.148	***
	(0.02)		(0.06)		(0.02)	
dA/A	-0.590	***	-0.446	***	-0.613	***
	(0.04)		(0.06)		(0.05)	
E/A	0.610	***	1.767	***	0.074	
	(0.23)		(0.55)		(0.20)	
GARCH	0.024	**	0.033	***	0.003	
	(0.01)		(0.01)		(0.01)	
ReturnVolatility	-0.004	***	-0.005	***	-0.003	**
	(0.00)		(0.00)		(0.00)	
CashFlow/Assets	1.228	***	-0.159		2.136	***
	(0.28)		(0.42)		(0.30)	
LagNetDebt/Assets	-0.859	***	-0.791	***	-1.051	***
	(0.05)		(0.06)		(0.07)	
NegativeRetainedEarn	-0.567	***	-0.625	***	-0.499	***
	(0.04)		(0.09)		(0.03)	
ChangeDivTaxRate	0.242	**	0.207	**	-0.331	
	(0.10)		(0.09)		(0.78)	
RepatTaxCutDummy	0.526	***			0.311	**
	(0.12)				(0.12)	
PreSafeHarbor	-0.914	***	-0.698	***		
	(0.13)		(0.14)			
LagReturn	-0.027	***	-0.027	***	-0.026	***
	(0.00)		(0.01)		(0.01)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-7 Continued

Variable	Whole Sample		1962-1989		1990-2009	
CFQuart2*GARCH	0.023	***	0.025	***	0.023	***
	(0.00)		(0.00)		(0.01)	
CFQuart3*GARCH	0.038	***	0.018	***	0.048	***
	(0.00)		(0.01)		(0.01)	
CFQuart4*GARCH	0.045	***	0.034	***	0.066	***
	(0.01)		(0.01)		(0.01)	
CFQuart2*ReturnVol	-0.004	***	-0.002		-0.005	***
	(0.00)		(0.00)		(0.00)	
CFQuart3*ReturnVol	-0.007	***	-0.000		-0.012	***
	(0.00)		(0.00)		(0.00)	
CFQuart4*ReturnVol	-0.008	***	-0.003	**	-0.014	***
	(0.00)		(0.00)		(0.00)	
Constant	-0.902	***	-0.433		-0.988	***
	(0.21)		(0.21)		(0.32)	
Industry Dummies	Y		Y		Y	
Year Clustered S.E.	Y		Y		Y	
Number of observations	118,992		56,445		62,547	
Adjusted R2	0.101		0.067		0.131	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-8. Linear combination for the choice to repurchase shares or not repurchase shares. This table shows the linear combination of coefficients for the interaction variables from Table A-7 for the firm's choice to either repurchase shares or not repurchase shares. A firm is considered to be a repurchaser if total repurchases are positive, where total purchases are defined as purchase of common and preferred stock (Compustat Item #115) plus the minimum of 0 and (preferred stock / redemption value (Compustat Item #56) minus lag(preferred stock / redemption value). Standard errors are shown in parenthesis. Base choice is to not repurchase shares.

Variable	Whole Sample		1962-1989		1990-2009	
GARCH	0.024	**	0.033	***	0.003	
	(0.01)		(0.01)		(0.01)	
GARCH + CFQuart2*GARCH	0.046	***	0.058	***	0.026	
	(0.01)		(0.01)		(0.02)	
GARCH + CFQuart3*GARCH	0.062	***	0.051	***	0.051	***
	(0.01)		(0.01)		(0.02)	
GARCH + CFQuart4*GARCH	0.069	***	0.068	***	0.068	***
	(0.01)		(0.01)		(0.02)	
ReturnVolatility	-0.004	***	-0.005	***	-0.003	**
	(0.00)		(0.00)		(0.00)	
ReturnVolatility+ CFQuart2*ReturnVol	-0.008	***	-0.007	***	-0.008	***
	(0.00)		(0.00)		(0.00)	
ReturnVolatility + CFQuart3*ReturnVol	-0.011	***	-0.005	***	-0.015	***
	(0.00)		(0.00)		(0.00)	
ReturnVolatility + CFQuart4*ReturnVol	-0.013	***	-0.008	***	-0.017	***
	(0.00)		(0.00)		(0.00)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-9. Multinomial logit regression for the choice to maintain or change repurchase level for prior repurchasers. This table shows the multinomial logit regression and linear combination for interaction coefficients for the firm's choice to either maintain or change their repurchase level given that they repurchased stock during the prior fiscal year. The firm's repurchase level is defined as purchase of common and preferred stock (Compustat Item #115) plus the minimum of 0 and (preferred stock / redemption value (Compustat Item #56) minus lag(preferred stock / redemption value). Standard errors are shown in parenthesis. Base choice is to maintain repurchase level.

Variable	Decrease Repurchase	Increase Repurchase	Decrease Repurchase	Increase Repurchase	Decrease Repurchase	Increase Repurchase
	Whole Sample		1962-1989		1990-2009	
NYP	-0.420 ***	-0.114	-0.047	0.274 **	-0.642 ***	-0.298 **
	(0.14)	(0.10)	(0.14)	(0.12)	(0.18)	(0.12)
MtoB	-0.040	-0.074 **	0.115	-0.059	-0.003	-0.044
	(0.03)	(0.04)	(0.09)	(0.08)	(0.03)	(0.04)
dA/A	0.736 ***	-0.003	0.746 ***	0.134	0.699 ***	-0.054
	(0.17)	(0.17)	(0.23)	(0.25)	(0.22)	(0.22)
E/A	-1.421 ***	0.425	-2.124 ***	-0.401	-1.074 ***	0.621
	(0.34)	(0.46)	(0.69)	(1.06)	(0.41)	(0.49)
GARCH	0.020 *	-0.008	0.022	-0.003	0.033 ***	0.002
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)
ReturnVolatility	0.008 ***	0.003	0.006	0.000	0.007 **	0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CashFlow/Assets	-1.619 ***	-0.104	-0.906	0.007	-2.132 ***	-0.208
	(0.47)	(0.50)	(1.00)	(1.18)	(0.49)	(0.58)
LagNetDebt/Assets	0.580 ***	-0.297 ***	0.721 ***	-0.156	0.654 ***	-0.292 **
	(0.08)	(0.10)	(0.16)	(0.13)	(0.10)	(0.14)
NegativeRetainedEarn	0.082	0.062	0.025	-0.150	0.055	0.077
	(0.09)	(0.07)	(0.19)	(0.20)	(0.10)	(0.08)
ChangeDivTaxRate	0.482	-0.567	-0.162	-2.127 ***	1.478	0.422 **
	(0.69)	(0.73)	(0.39)	(0.71)	(0.92)	(0.18)
RepatTaxCutDummy	-0.529 ***	-0.063			-0.381 ***	0.001
	(0.14)	(0.10)			(0.14)	(0.10)

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-9 Continued

Variable	Decrease Repurchase	Increase Repurchase	Decrease Repurchase	Increase Repurchase	Decrease Repurchase	Increase Repurchase
	Whole Sample		1962-1989		1990-2009	
PreSafeHarbor	0.231 ***	-0.060	-0.001	-0.174 *		
	(0.09)	(0.08)	(0.07)	(0.09)		
LagReturn	0.007	0.059 ***	0.033	0.050	-0.016	0.064 **
	(0.02)	(0.02)	(0.03)	(0.04)	(0.04)	(0.03)
CFQuart2*GARCH	0.001	0.006	-0.029	-0.019	-0.006	-0.007
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)
CFQuart3*GARCH	-0.022 **	-0.013 *	-0.040 **	-0.040	-0.012	-0.004
	(0.01)	(0.01)	(0.02)	(0.03)	(0.01)	(0.01)
CFQuart4*GARCH	-0.042 ***	-0.025 ***	-0.039 *	-0.025	-0.048 ***	-0.031 ***
	(0.01)	(0.01)	(0.02)	(0.03)	(0.01)	(0.01)
CFQuart2*ReturnVol	-0.001	-0.004	0.004	0.005	0.003	-0.001
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
CFQuart3*ReturnVol	0.008 ***	0.006 **	0.013 ***	0.016 **	0.003	-0.000
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
CFQuart4*ReturnVol	0.017 ***	0.012 ***	0.016 ***	0.015 **	0.018 ***	0.012 ***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
Constant	1.517 ***	1.354 ***	1.875 **	2.108 **	1.163 **	0.861 *
	(0.47)	(0.42)	(0.80)	(0.85)	(0.57)	(0.51)
Industry Dummies	Y	Y	Y	Y	Y	Y
	Y	Y	Y	Y	Y	Y
Number of observations	35,403	35,403	13,325	13,325	22,078	22,078
	0.044	0.044	0.029	0.029	0.057	0.057

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-10. Linear combination for the choice to maintain or change repurchase level for prior repurchasers. This table shows the linear combination of coefficients for the interaction variables from Table A-9 for the firm's choice to either maintain or change their repurchase level given that they repurchased stock during the prior fiscal year. The firm's repurchase level is defined as purchase of common and preferred stock (Compustat Item #115) plus the minimum of 0 and (preferred stock / redemption value (Compustat Item #56) minus lag(preferred stock / redemption value). Standard errors are shown in parenthesis. Base choice is to maintain repurchase level.

Variable	Decrease Repurchase		Increase Repurchase		Decrease Repurchase		Increase Repurchase		Decrease Repurchase		Increase Repurchase	
	Whole Sample				1962-1989				1990-2009			
GARCH	0.020	*	-0.008		0.022		-0.003		0.033	***	0.002	
	(0.01)		(0.01)		(0.02)		(0.02)		(0.01)		(0.01)	
GARCH + CFQuart2*GARCH	0.020	*	-0.002		-0.007		-0.023		0.027	**	-0.004	
	(0.01)		(0.01)		(0.01)		(0.01)		(0.01)		(0.01)	
GARCH + CFQuart3*GARCH	-0.003		-0.022	***	-0.018		-0.044	***	0.021		-0.002	
	(0.01)		(0.01)		(0.01)		(0.01)		(0.02)		(0.01)	
GARCH + CFQuart4*GARCH	-0.022	*	-0.033	***	-0.016		-0.028		-0.015		-0.029	***
	(0.01)		(0.01)		(0.01)		(0.02)		(0.02)		(0.01)	
ReturnVolatility	0.008	***	0.003		0.006		0.000		0.007	**	0.001	
	(0.00)		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)	
ReturnVolatility+ CFQuart2*ReturnVol	0.007	***	-0.001		0.010	***	0.005		0.010	***	0.001	
	(0.00)		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)	
ReturnVolatility + CFQuart3*ReturnVol	0.016	***	0.008	***	0.019	***	0.016	***	0.010	***	0.001	
	(0.00)		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)	
ReturnVolatility + CFQuart4*ReturnVol	0.025	***	0.015	***	0.022	***	0.015	***	0.024	***	0.013	***
	(0.00)		(0.00)		(0.00)		(0.01)		(0.00)		(0.00)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-11. Logit regression for the choice to maintain or increase repurchase level for prior non-repurchasers. This table shows the logit regression and linear combination for interaction coefficients for the firm's choice to either maintain or change their repurchase level given that they did not repurchase stock during the prior fiscal year. The firm's repurchase level is defined as purchase of common and preferred stock (Compustat Item #115) plus the minimum of 0 and (preferred stock / redemption value (Compustat Item #56) minus lag(preferred stock / redemption value). Standard errors are shown in parenthesis. Base choice is to maintain not repurchasing shares.

Variable	Whole Sample		1962-1989		1990-2009	
NYP	0.398	**	-0.094		0.517	**
	(0.20)		(0.16)		(0.24)	
MtoB	-0.147	***	-0.346	***	-0.146	***
	(0.02)		(0.06)		(0.02)	
dA/A	-0.514	***	-0.446	***	-0.547	***
	(0.04)		(0.06)		(0.05)	
E/A	0.261		1.767	***	0.082	
	(0.18)		(0.55)		(0.18)	
GARCH	0.028	***	0.033	***	0.015	*
	(0.01)		(0.01)		(0.01)	
ReturnVolatility	-0.004	***	-0.005	***	-0.003	***
	(0.00)		(0.00)		(0.00)	
CashFlow/Assets	1.436	***	-0.159		1.776	***
	(0.26)		(0.42)		(0.28)	
LagNetDebt/Assets	-1.043	***	-0.791	***	-1.146	***
	(0.05)		(0.06)		(0.06)	
NegativeRetainedEarn	-0.496	***	-0.625	***	-0.489	***
	(0.03)		(0.09)		(0.03)	
ChangeDivTaxRate	0.158		0.207	**	-0.317	
	(0.11)		(0.09)		(0.50)	
RepatTaxCutDummy	0.331	***			0.239	**
	(0.09)				(0.10)	
PreSafeHarbor	-0.441	***	-0.698	***		
	(0.08)		(0.14)			
LagReturn	-0.015	***	-0.027	***	-0.019	***
	(0.00)		(0.01)		0.006	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-11 Continued

Variable	Whole Sample		1962-1989		1990-2009	
CFQuart2*GARCH	0.015	***	0.025	***	0.023	***
	(0.00)		(0.00)		(0.01)	
CFQuart3*GARCH	0.026	***	0.018	***	0.037	***
	(0.00)		(0.01)		(0.01)	
CFQuart4*GARCH	0.037	***	0.034	***	0.049	***
	(0.01)		(0.01)		(0.01)	
CFQuart2*ReturnVol	-0.003	***	-0.002		-0.004	***
	(0.00)		(0.00)		(0.00)	
CFQuart3*ReturnVol	-0.005	***	-0.000		-0.008	***
	(0.00)		(0.00)		(0.00)	
CFQuart4*ReturnVol	-0.007	***	-0.003	**	-0.008	***
	(0.00)		(0.00)		(0.00)	
Constant	-1.464	***	-0.433	**	-1.147	***
	(0.27)		(0.21)		(0.33)	
Industry Dummies	Y		Y		Y	
Year Clustered S.E.	Y		Y		Y	
Number of observations	66,654		56,445		43,792	
Adjusted R2	0.086		0.067		0.105	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

Table A-12. Linear combination for the choice to maintain or increase repurchase level for prior non-repurchasers. This table shows the linear combination of coefficients for the interaction variables from Table A-11 for the firm's choice to either maintain or change their repurchase level given that they did not repurchase stock during the prior fiscal year. The firm's repurchase level is defined as purchase of common and preferred stock (Compustat Item #115) plus the minimum of 0 and (preferred stock / redemption value (Compustat Item #56) minus lag(preferred stock / redemption value). Standard errors are shown in parenthesis. Base choice is to maintain not repurchasing shares.

Variable	Whole Sample		1962-1989		1990-2009	
GARCH	0.028	***	0.033	***	0.015	*
	(0.01)		(0.01)		(0.01)	
GARCH + CFQuart2*GARCH	0.043	***	0.045	***	0.039	***
	(0.01)		(0.01)		(0.01)	
GARCH + CFQuart3*GARCH	0.054	***	0.044	***	0.053	***
	(0.01)		(0.01)		(0.01)	
GARCH + CFQuart4*GARCH	0.065	***	0.054	***	0.065	***
	(0.01)		(0.01)		(0.01)	
ReturnVolatility	-0.004	***	-0.005	***	-0.003	***
	(0.00)		(0.00)		(0.00)	
ReturnVolatility+ CFQuart2*ReturnVol	-0.006	***	-0.006	***	-0.006	***
	(0.00)		(0.00)		(0.00)	
ReturnVolatility + CFQuart3*ReturnVol	-0.008	***	-0.005	***	-0.010	***
	(0.00)		(0.00)		(0.00)	
ReturnVolatility + CFQuart4*ReturnVol	-0.010	***	-0.007	***	-0.011	***
	(0.00)		(0.00)		(0.00)	

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively

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BIOGRAPHICAL SKETCH

Brian received his Bachelor of Science in mathematics with a minor in finance from Trevecca Nazarene University in Nashville, Tennessee. He then earned his Master of Business Administration in finance and management from the Crummer Graduate School of Business at Rollins College in Winter Park, Florida. Brian also worked in the research department of CNL Income Corp. in Orlando while attending Crummer. After finishing his MBA degree, Brian began Ph.D. studies in Finance at the University of Florida. After completing his Ph.D. in 2011, Brian accepted a position as Assistant Professor of Finance at the University of Tulsa in Tulsa, Oklahoma.