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AN EXAMINATION OF THE INFORMATION CONTENT OF FUNDS FROM OPERATIONS (FFO) USING POLYNOMIAL REGRESSION AND RESPONSE SURFACE METHODOLOGY

BY

FRANK GYAMFI-YEBOAH

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree

of

Doctor of Philosophy

in the Robinson College of Business

of

Georgia State University

GEORGIA STATE UNIVERSITY

ROBINSON COLLEGE OF BUSINESS

2010

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ACCEPTANCE

This dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor in Philosophy in Business Administration in the Robinson College of Business of Georgia State University.

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ABSTRACT

AN EXAMINATION OF THE INFORMATION CONTENT OF FUNDS FROM OPERATIONS (FFO) USING POLYNOMIAL REGRESSION AND RESPONSE SURFACE METHODOLOGY

By

FRANK GYAMFI-YEBOAH

JULY 22, 2010

Committee Chair: Dr. Alan Ziobrowski

Major Department: Real Estate

I examine the market reaction to the announcement of FFO by REITs using abnormal trading volume as a gauge of investors' reaction. I also address the question of whether FFO provides more useful information to investors than net income. Lastly, I examine whether the quality of private information among traders prior to the announcement of FFO affects the level of abnormal trading volume.

Using three different specifications, I find that even though the announcement of FFO leads to abnormal trading, there is no association between the level of abnormal trading volume and the size of the surprise contained in the FFO announcement. I also find, using abnormal returns as a

measure of investor response, that FFO explains significantly more variance in abnormal returns than net income suggesting that FFO provides more useful information than net income.

Lastly, I use the proportion of institutional holdings as a proxy for the number of informed traders to predict the amount of abnormal trading volume. I find no significant relation between abnormal trading volume and the proportion of institutional holdings. However, when I break down institutional ownership into two broad classifications, I find that the level of abnormal trading volume is significantly positively related to the holdings by mutual funds and investment advisors but negatively related to the holdings of other institutions (pension funds &.endowments, banks and insurance companies). This raises questions of whether the use of an aggregate measure of institutional ownership is appropriate in studies that examine the effect of institutional holdings.

CHAPTER ONE

Background

Finance and Accounting theories suggest investors use earnings information in the valuation of stocks. Most of the valuation models assert that the value of stock should relate to its earnings capacity. It is, therefore, no surprise that earnings information remains highly sought after by investors. As a consequence, researchers have, over the past four decades, hypothesized a strong relationship between earnings and stock prices. The results from such studies, however, often show a weak relationship.

The fundamental question addressed in a majority of the past studies is whether a significant relationship exists between the announcement of unexpected earnings and any observed abnormal returns around the announcement date. The premise of this question is that if financial markets are efficient and earnings information is indeed central to the pricing of stocks, then the announcement of unexpected earnings should lead to stock repricing. The apparent disconnect between the strong relationship posited in most studies and the weak empirical relationship observed between unexpected earnings announcements and abnormal returns remains a puzzle.

A number of explanations have emerged to explain the weak empirical relationship including the possibility of a misspecification of the equation estimating the returns/earnings relationship. Much of the effort at improving the specification has focused on either using alternative earning metrics such as net income or using a non-linear specification. Notwithstanding these attempts, the reported relationship between earnings and returns remains weak.

A related question is whether the relation between stock price changes and unexpected earnings captures only some aspects of investors' reaction to the information content of earnings announcements. Lev (1989) argues that "stock price change is, of course, a restricted indicator of information usefulness, since in a heterogeneous belief setting; investors might use the information without the price being changed". This line of reasoning suggests that other indicators of investors' behavior such as volume of trading may reflect more fully the reaction of investors to the announcement of unexpected earnings. A number of studies including Bamber (1986), Atiase and Bamber (1994) and Utama and Cready (1997) have used trading volume to assess the information content of EPS and documented significant market reaction following earnings announcement.

The peculiar nature of real estate investment trusts (REITs) necessitated the introduction of additional performance metrics in addition to the traditional earnings per share (EPS) metric used for industrial stocks. Although the most widely publicized metric in the REIT industry is funds from operations (FFO), legitimate questions have been raised as to whether FFO provides superior information to investors compared to other metrics such as net income. It has, for instance, been argued that since FFO is unaudited it may be subject to manipulation by management. Such a possibility can raise serious doubts about its credibility in investors' minds. Fields, Rangan and Thiagarajan (1998) document evidence that suggests FFO may not necessarily be more useful than net income and find that the superiority of one over the other is highly contextual. In a similar study, Gore and Stott (1998) conclude that although FFO appeared

to be relatively more informative than net income, the difference in the usefulness between the two measures was not statistically significant.

Most previous research uses a difference score (expected FFO minus actual FFO) as a proxy for unexpected FFO in regression analyses to predict abnormal returns or abnormal trading volume. However, in a recent study by Gyamfi-Yeboah, Ziobrowski and Lambert (2009), this approach is shown to be misspecified. The authors present an alternative approach that uses expected and actual FFO as separate variables and includes their interaction and higher order terms in the analysis. They test the constraints imposed by the traditional specifications and find that the constraints are not empirically supported.

Using this approach, I examine the information content of FFO with specific emphasis on the strength of the relationship between unexpected FFO announcements and abnormal trading volume around the announcement dates. Also, I assess the information content of net income and address the question of whether FFO offers greater information content to investors than net income.

Objectives of the Dissertation

My main objective in this dissertation is to examine the information content of FFO to investors using a polynomial regression and response surface methodology, an approach that addresses the problems associated with earlier studies such as constrained relationships. Specifically, I seek answers to the following questions:

- Is the announcement of unexpected FFO followed by abnormal trading?
    - Is the abnormal trading stronger for positive or negative surprises?
- Does a difference in the quality of private information among traders prior to the announcement of FFO affect the level of abnormal trading volume?
- Is FFO more informative to investors than net income?

Contribution of the Dissertation

I extend the literature in several significant ways. First, I apply an alternative approach, polynomial regression and response surface methodology, to examine the information content of FFO. This approach, unlike those used in prior studies, does not collapse the conceptually distinct variables that make up unexpected FFO (i.e. expected and actual FFO) into a single construct. Rather, it uses them as separate independent variables in addition to the interaction and higher order terms. It must be stressed that collapsing actual and expected FFO into a single measure (a difference score) implies the implausible assumption that the market reacts the similarly to a situation where actual FFO exceeds expected FFO (a positive surprise) as it does when actual FFO is less than expected (a negative surprise). Difference score approaches, which

have been widely adopted in the literature, are prone to serious methodological issues (See Cronbach (1958), Edwards (2001) and Edwards (2002),). These issues include reducing a three-dimensional relationship into two dimensions and imposing untested restrictions on relationships. Polynomial regression, on the other hand, provides an opportunity for the constraints imposed by difference scores to be tested empirically and presents the relationship between the variables in three dimensions.

My second contribution to the literature is to test Kim and Verrecchia's (1991) hypothesis that when there is a differential in the precision of private information held by traders, the announcement of new information will cause "differential belief revision" among the traders and lead to abnormal trading volume. The authors note that "relatively better informed traders revise their beliefs less because the new information is relatively less important to them than to those who are more poorly informed". In other words, the level of abnormal trading following the announcement of unexpected FFO will be less for REITs with more informed investors prior to the announcement. To test this hypothesis, I follow Kim, Krinsky and Lee (1997) and Utama and Cready (1997) and use the level of institutional ownership as a proxy for the extent of the differential in the quality of private information among traders. I argue that institutional investors are less likely to differ in the precision of their privately held information than individual investors. Thus, REITs with higher levels of institutional ownership are more likely to have lower levels of abnormal trading. In contrast to the predictions above, Kim, Krinsky and Lee (1997) examine the relationship between abnormal trading volume and institutional ownership and suggest a strong positive relationship. However, Utama and Cready (1997) show that the

relationship between trading volume and the level of institutional ownership is quadratic and that this relationship is negative when institutional ownership is high. Since the early 1990s, REITs have, on average, tended to have higher concentrations of institutional ownership than other stocks (Chan, Leung and Wang, 1998). Also, the REIT operating environment differs from other firms due to high transaction costs and lower information production (Devos, Ong, and Spieler (2007) and Downs and Guner (1999)). Furthermore, Downs and Guner (1999) find that the information flow in the real estate securities market may be as deficient as in the underlying real estate asset. As a result, private informational advantage among REIT investors might be more pronounced than among industrial stock investors. The characteristics of REITs and their unique operating environment provide a good setting to test Kim and Verrecchia's (1991) hypothesis.

Finally, I explore the question of whether FFO is more useful to investors than net income within the context of how investors react to the unexpected announcement of the two performance metrics. Fields, Rangan and Thiagarajan (1998) assess the usefulness of FFO and net income by analyzing the association of FFO and net income with operating cash flow and current stock prices. However, similar to Gore and Stott (1998), I examine the relative usefulness of the two measures by exploring how investors react to the announcement of either unexpected FFO or net income. It is important to stress that the sample used by Gore and Stott (1998) covered the period from 1991 to 1996, prior to the National Association of Real Estate Investment Trusts' (NAREIT) major review of the calculation of FFO in 2000, which was aimed at improving its uniformity and reliability. Baik, Billings and Morton (2008) document evidence that suggests the information content of FFO increased after 2000. These authors do not address the question of

whether FFO has become more useful than net income following the changes NAREIT introduced in 2000.

Scope of the Dissertation

The majority of the empirical work examining the relation between earnings and returns has focused on assessing the information content of GAAP earnings metrics; particularly earnings per share (EPS). The introduction of a non-GAAP metric such as FFO by NAREIT in 1991 for the REIT industry provides a natural extension to the earnings/returns research. The primary question addressed in these studies is the extent to which new measures such as FFO are useful to investors. A number of studies (Gore and Tott (1998); Graham and Knight (2000); Stunda and Typpo (2004); Baik, Billings and Morton (2008)) have addressed this question in the context of the REIT industry. But as noted already, the approach adopted in all of these studies suffers from serious methodological issues, which may mask the relationship between FFO and returns. Using polynomial regression and response surface analysis, which place no constraints on these relationships, this study examines the information content of FFO by carrying out two interconnected empirical investigations.

First, I examine the information content of FFO by assessing the strength of the relationship between unexpected FFO and abnormal trading around the announcement date. I choose to use abnormal trading for two reasons; first, trading volume is more likely to reflect more fully the reaction of investors to FFO announcements and therefore has the potential to provide more

insights regarding the usefulness of FFO to investors. Second, using trading volume allows for the test of Kim and Verrecchia's (1991) hypothesis which states that the level of abnormal trading following the announcement of an unexpected FFO will be less for REITs with more informed investors

Secondly, I examine whether FFO is more useful to investors than alternative measures such as net income. Although, this issue has previously been addressed in the literature, there are still a number of unresolved questions. Neither Fields et. al (1998), Vincent (1999) nor Gore and Stott (1998) provide definite conclusion on the superiority of FFO over net income. Also, NAREIT's decision to revise the definition of FFO and provide more clarity in 2000 may have altered investors' views of the two metrics. Therefore, addressing the question in a post-2000 period has the potential to provide new insights.

I limit this study to equity REITs, defined as REITs that invest in income-producing real estate and derive at least 75% of their revenues from such properties. I focus on equity REITs because depreciation, which is one of the most significant items excluded in the calculation of FFO, is unlikely to be substantial for Mortgage or Hybrid REITs. As a result, I expect the difference in investors' perception of FFO versus net income to be more pronounced in equity REITs than either mortgage or hybrid REITs.

Organization of the Dissertation

The rest of the study is organized as follows. The next chapter reviews the relevant literature. Chapter 3 describes the data and presents the methodology while chapter 4 presents the results. Chapter 5 concludes the study.

CHAPTER TWO

LITERATURE REVIEW

This chapter presents a review of the extant literature. The first part discusses studies that have examined the relationship between earnings and returns. The second part reviews studies that have focused on examining the information content of earnings but within the context of how trading volume responds to unexpected earnings announcements. The third and fourth sections present the background of FFO and studies that have examined the information content of FFO, respectively, while hypotheses are presented in the last section.

The Returns/Earnings Research

The research assessing the information content of earnings is extensive and dates back to the pioneering work of Ball and Brown (1968) and Beaver (1968). Most of this research centers on the extent to which earnings metrics produced by the accounting profession are useful to investors and also to test the efficient market hypothesis. Much of the research prior to the 1990s focused on measurement issues for both return and earnings. On the return side, Haggerman, Zmijewski and Shah (1984), Wilson (1986), and Bowen and Daley (1987) use abnormal returns as a proxy for the return variable, while Beaver, Lambert and Ryan (1987) and Jacobson (1987) use raw returns. Measures for the earnings variable include earnings per share (EPS) (Haggerman et al, 1984; Hopwood and McKeown, 1985; Lipe, 1986; Hughes and Ricks, 1987) and net income (Beaver, Griffin and Landsman, 1982). Despite some use of alternative measures in previous studies, the use of residual returns and EPS is dominant in the literature.

Lev (1989) reviews and summarizes the findings of research focused on assessing the usefulness of earnings over the period 1980 – 1988. The major finding of this review is that the correlation between earnings and stock returns is low and the nature of the returns/earnings relationship was unstable over time. The small variance in returns explained by earnings is also relatively insensitive to the choice of the length of the return window. For instance, for windows of 2 to 5 days, the variance in abnormal returns explained by unexpected earnings ranged from 2% to 5% and for windows of 3 months to 2 years unexpected earnings explained only 4% to 7% of the variance in abnormal return. Lev (1989) identifies a number of reasons that might explain the lack of a strong relation between earnings and returns and suggests a possible misspecifiation of the returns/earnings equation.

Cheng, Hopwood and McKeown (1992) examine the specification of the cross-sectional, ordinary least square models and find that severe specification problems exist in the linear regression models. Specifically, they find the most pronounced misspecification problem to be the assumption of linearity. Although Cheng et al reject the linear specifications used in prior research, they provide little guidance on alternative models that might allow for curvilinear relationships or would address the problems associated with traditional approaches. Freeman and Tse (1992) also argue that "transitory earnings surprises should have less impact on security prices than permanent earnings surprises". This line of reasoning also suggests that the returns/earnings relationship is curvilinear. Even though Cheng et al (1992) and Freeman and Tse (1992) provide a strong case to re-examine the specification of the returns/earnings relationship, subsequent research continued to use linear models and a difference score (actual

earnings minus expected earnings) to predict abnormal returns. In a recent study, Gyamfi-Yeboah et al (2009) adopt an alternative specification with REIT returns using expected and actual FFO as separate variables and include interaction and higher order terms to test the constraints imposed by the approach frequently adopted in previous research. The authors show that the constraints imposed by the models used in prior research are not supported and provide evidence that these models are misspecified.

An area of inquiry that has received little attention is whether the market responds equally to situations where actual earnings exceeds expected earnings (a positive surprise) as it does when actual earnings are less than expected earnings (a negative surprise). Schipper (1991) summarizes evidence from several empirical studies that shows that analysts, on average, tend to be optimistic in their forecasts. If investors are aware of the bias there should be stronger market responses to positive surprises than negative surprises for the same absolute unexpected earnings announcements (Freeman and Tse (1992)). This reasoning implies that price responses to unexpected earnings announcements could be asymmetric, which is contrary to assumptions made in most previous studies. In a more recent study, however, Brown (2001) finds that the median earnings surprise was negative in the eighties, zero in the early nineties and positive in the mid to late nineties. This suggests that if the bias in analysts' forecasts is the sole explanation for an asymmetric response to earnings surprises then the pessimistic bias in analysts' estimates in the late nineties should lead to stronger market reaction to negative surprises. Basu (1997) provides an alternative explanation for the asymmetric market reaction to earnings surprises documented in his study. The author notes that conservatism encourages accountants to

anticipate bad news and to usually regard it as a one-time earnings shock. In contrast, good news is recognized gradually over an extended period of time. Thus, the market recognizes positive earnings surprises as more persistent than negative earnings surprises. As a result, market reaction will be stronger for positive than negative surprises.

The results from the few studies that have hypothesized an asymmetric response to unexpected earnings announcement are mixed. Freeman and Tse (1992) hypothesize a stronger response for positive surprises but find no empirical support. Conrad, Cornell and Landsman (2002) find that the market's response to a negative surprise is stronger than the response to a positive surprise. Skinner and Sloan (2002) find a similar result to Conrad, Cornell and Landsman (2002), but show that the asymmetrical response holds only for growth stocks. Bartov, Givoly and Hayn (2002) and Lopez and Rees (2002), on the other hand, provide evidence that the rewards for firms that beat analyst forecast is higher than the penalty for those that fail to meet market expectations.

Trading Volume/Earnings Research

Trading volume has received considerable attention as an alternative to using the returns/earnings relationship to examine the information content of earnings. The advocates for using trading volume in addition to returns argue that the relationship between stock price changes and unexpected earnings captures only some aspects of investors' reactions to the information content of earnings announcements. Thus, investors may respond to the new

information without necessarily causing a price change. Beaver (1968) discusses a number of scenarios where reaction to new information may be observed in either price or trading volume but not both. He also argues that even when a reaction is observed in both measures, the response may not be equal. Although findings in a number of empirical studies based on trading volume have not differed significantly from those based on security prices, there is no reason to expect that studies comparing both measures would yield identical results (Bamber (1986). Morse (1980) documents results that suggest that trading volume responses to the announcements of earnings is more pronounced than price response. Bamber and Cheon (1995) provide evidence of substantial differences in trading volume and price reactions around earnings announcements. They conclude that such different reactions suggest that "trading volume-based research has the potential to yield insights beyond that attainable through-price-based research".

Kim and Verrecchia (1991) argue that traders with better predisclosure private information react less to new information than those who are more poorly informed. Moreover, it is the existence of a differential in the quality of available information that creates abnormal trading volume. A number of studies have tested this hypothesis using various proxies for the differential in the quality of private information available to investors prior to earnings announcements. Atiase and Bamber (1994) use the dispersion in analysts' forecasts and the range across the most optimistic and the most pessimistic analyst EPS forecasts as proxies and find support for the Kim - Verrecchia (KV) hypothesis. They note a number of limitations with their proxies including the fact that the proxies reflect divergent expectations among analysts and not differences in the quality of predisclosure information as the theoretical proposition predicts. Kim, Krinsky and

Lee (1997) and Utama and Cready (1997) use the level of institutional holdings as a proxy. Contrary to the theoretical prediction, Kim et al (1997) find a significant positive relationship between abnormal trading volume and the level of institutional holdings. In a similar study that allows for nonlinearity in the relation, Utama and Cready (1997) show that the association between trading volume and the level of institutional ownership is quadratic and that the relation is negative in the high institutional ownership range. Specifically, they find the point of inflection to be about the 50% level of institutional ownership for their sample. This suggests that the impact of a differential in the quality of private predisclosure information on the levels of abnormal trading as predicted by the KV hypothesis might hold in samples with higher institutional holdings. Ali, Klasa and Li (2008) argue that institutions holding small stakes are unlikely to devote significant resources to gather private information and it might therefore be erroneous to treat such investors as well informed relative to individual investors. Furthermore, institutions with high ownership generally do not trade around earnings announcements since they are usually dedicated investors or face regulatory restrictions[1]. Ali et al (2008) therefore propose a refined measure of institutional ownership that treats institutions with medium holdings as investors with better predisclosure private information who are likely to trade around the announcement of earnings. They confirm the inverted U-shaped relationship between the levels of institutional holdings and abnormal trading surrounding earnings announcement documented in Utama and Cready (1997).

[1] Ali et al (2008), citing Bushee (1998) classifies institutions with a 5% or greater stake as dedicated investors since such investors are likely to be long-term investors. They also point out the sections of the securities regulations that such investors must abide by and argue that institutions with at least a 5% stake will not subject themselves to the extra scrutiny if they do not intend to be dedicated investors.

Background of Funds from Operation (FFO)

The unique nature of REITs necessitated the introduction of FFO by the National Association of Real Estate Investment Trusts (NAREIT) in 1991 as a supplementary performance measure. NAREIT's rationale for advocating such a measure was that depreciation, which forms part of GAAP earnings measures, was very substantial for equity REITs. Since depreciation is not an actual cash expense, its inclusion had the effect of distorting the true performance of REITs. The original definition of FFO stated that depreciation and amortization should be added back to consolidated net income. The definition has since been clarified in 1995, 1999 and 2002.

It is apparent from various statements issued by NAREIT that its original purpose in promoting FFO was quite modest. For instance, it states in its 2002 white paper that "the original intent was that FFO be used for the sake of determining a supplemental capitalization multiple similar to a P/E ratio" and that "FFO was not intended to be used as a measure of the cash generated by a REIT nor of its dividend paying capacity".

Since its introduction in 1991, the definition of the FFO measure has been revised a number of times. The changes made in 1995 to exclude nonrecurring items had unintended consequences as it created an opportunity for management to exercise discretion in what items it chose to add or exclude. The fact that FFO is an unaudited measure makes it impossible to detect any manipulations and raises serious doubts in the minds of some investors about its reliability (Martinez, 1998). NAREIT responded to these concerns by establishing a Best Financial Practices Council to provide recommendations on how best to improve the uniformity and reliability of FFO. NAREIT adopted the recommendations of the Council in a National Policy

Bulletin issued on November 8, 1999 to include both recurring and nonrecurring items, effective January 2000. The National Policy Bulletin further clarified items that should be excluded from the calculation of FFO.

Even though FFO is generally recognized by both REITs and investors, NAREIT concedes in a white paper issued in 2002 that greater guidance and interpretation was still needed. One area that remained ambiguous was the items firms could include as amortized items. The purpose of the 2002 white paper was to address such problems. In its National Policy Bulletin issued in February, 2004, NAREIT noted that to "enhance usefulness and effectiveness of FFO" it was accepting the recommendations of the Best Financial Practices Council to develop "best practices" disclosures models. Such models are aimed at advancing consistency in financial reporting among REITs.

It is evident from the foregoing discussion that FFO has evolved with a number of modifications since its introduction in 1991. Most of the changes have been in response to concerns of investors and analysts about the lack of consistency and uniformity in the calculation and reporting of FFO. The current definition per NAREIT's white paper in 2002 is as follows:

> *"Funds from Operation means net income (computed in accordance with generally accepted accounting principles), excluding gains (or losses) from sales of property, plus depreciation and amortization and after adjustments for unconsolidated partnerships and joint ventures".*

FFO/Returns Studies

Relative to studies examining the information content of EPS, the research on the usefulness of FFO is less extensive. Vincent (1999) examined the information content of EPS versus FFO. using a model based on analysts' forecasts. The results show no significant relationship between unexpected FFO and cumulative abnormal returns over both short and long-term windows. Similarly, Gore and Stott (1998) provide evidence suggesting unexpected FFO is not related to abnormal returns over the short run. Using annual return windows, Stunda and Typpo (2004) find a significant relationship with FFO and EPS as independent variables and abnormal returns as the dependent variable. However, it is impossible to solely assess the information content of FFO because Stunda and Typpo (2004) include both EPS and FFO in their regression.

Higgins, Ott and Ness (2006) examine the market's response to the FFO changes introduced in 2000 and find no significant reaction, suggesting that investors' perceptions of FFO may not have been altered significantly. However, in a more recent study, Baik, Billings and Morton (2008), use a sample covering the period 1995 - 2003 and provide evidence that suggests the information content of FFO has significantly increased since 2000 and investors perceive less manipulation and greater reliability.

A related line of research examines the question of whether FFO is more useful than net income. This question arises out of the claim that FFO is superior to net income because it reflects more accurately the performance of REITs. However, since FFO is unaudited and only an industry-sanctioned metric, there are doubts as to whether it provides more useful information than the

traditional GAAP measures. Fields, Rangan and Thiagarajan (1998) assess the relative usefulness of FFO and net income by analyzing the association of FFO and net income or operating cash flows and current stock prices. They find that FFO may not be more useful than net income and that the superiority of one over the other depends on whether usefulness is defined as the ability of the two measures to explain subsequent operating performance or contemporaneous stock prices. In a similar study, Gore and Stott (1998) conclude that although FFO appears to be more informative than net income, the difference was not statistically significant. Vincent (1999) also examines the relative information content of EPS, FFO, cash from operations (CFO) and earnings before interest, taxes, depreciation and amortization (EBITDA) and concludes that there is no greater information content in FFO compared to the other three measures. The author argues that the lack of consistency in the computation of FFO across REITs and the fact that FFO is not audited may explain why investors still rely on EPS even though it has been shown not to correctly reflect REIT performance. Graham and Knight (2000) also conclude that FFO has greater information content than net income.

Hypotheses

Based on the assertions of the efficient market hypothesis and evidence from a number of empirical studies, I hypothesize the following:

H1: There is a significant positive relationship between unexpected FFO and abnormal trading volume around the announcement date.

H2: The market response to positive FFO surprises is stronger than responses to negative surprises

The evidence documented in the literature suggests that analysts tended to be optimistic in their forecasts prior to the late nineties (Devos et al (2007), Brown (2001)). However, this tendency has dissipated in recent years, suggesting a symmetric response to positive and negative surprises. However, the conservatism argument put forward by Basu (1997) would suggest a stronger reaction to positive than negative surprises. Notwithstanding the mixed results in previous studies, the evidence seems to support an asymmetric response.

H3: The relationship between unexpected FFO and abnormal trading volume should be stronger than the association between unexpected NI and abnormal trading volume.

In January of 2000, NAREIT implemented guidelines aimed at ensuring the uniformity and reliability of FFO. Additionally, the SEC introduced rules in 2003 that impose stricter controls over FFO. These measures should make FFO more reliable and less susceptible to manipulation. Given the interventions described above and the fact that FFO is generally viewed as a more

accurate measure of REIT operating performance, I expect FFO to be more useful to investors than net income.

H4: REITs with higher institutional holdings will have less abnormal trading volume than those with low institutional holdings.

Since abnormal trading volume may be the result of a differential in the quality of private information available to traders prior to the announcement of an unexpected FFO (Kim and Verrecchia (1991)), I expect abnormal trading volume to be lower for REITs with higher percentage of institutional investors.

CHAPTER 3

Data and Methodology

Data

I use the Institutional Brokers' Estimate System (IBES) database to identify REITs with unexpected FFO and Net Income (NI) during the periods January 1997 to December 1999 and January 2004 to December 2006. I use the two periods to enable me to compare the information content of FFO before and after the changes made by NAREIT to the definition of FFO and also to ensure the robustness of the findings. The IBES database provides information on analysts' forecasts of FFO and NI and actual FFO and NI for REITs listed on the New York Stock Exchange (NYSE) and the American Stock Exchange (AMEX). Daily return and trading volume data are derived from the Center for Research in Security Prices (CRSP) database. I obtain data on institutional holdings from CDA/Spectrum 13(f) institutional stock holdings, which are published quarterly.

Prior to analyzing the data, each of the independent variables is centered at the mean of their means. As noted by Lambert, Edwards and Cable (2003), such a procedure facilitates the interpretation of results. Furthermore, the data is screened for outliers and influential cases. Following Fox (1991), I use leverage, Cook's D statistic, and standardized residuals from the quadratic regression equation. Three observations that exceed the minimum cut off on all three criteria and are clearly discrepant on scatter plots are dropped.

Methodology

I use the event study methodology to derive the excess returns around an FFO or NI announcement. Daily excess returns around the event date will be calculated based on the value-weighted daily return data from the CRSP. I calculate the cumulative excess return based on three different event windows: 2, 3 and 5 days around the date of the announcement using an estimation period of 250 days ending 20 days prior to the event.

Two alternative measures will be used to estimate abnormal trading volume around an announcement of an unexpected FFO or Net Income announcement. First, I follow Chae (2005) and calculate abnormal trading volume as follows:

$$\text{Abnormal Volume} = \text{Log Turnover} - \text{Log Normal Turnover} \qquad (1)$$

$$\text{Where Log Turnover} = \text{Log}\left(\frac{\text{Trading Volume}_{i,t}}{\text{Outstanding Shares}_{i,t}}\right)$$

$$\text{Log Normal Turnover} = \frac{1}{30}\left(\sum_{t=-40}^{t=-11}\text{Log Turnover}\right)$$

Second, I calculate abnormal trading volume based on the market model estimated using the CRSP value-weighted index over a 30-day estimation period[2] ending 11 days prior to the announcement.

[2] To ensure that results are robust, alternative specifications using different estimation periods are used and the results remain qualitatively the same.

I test hypotheses 1, 2, & 3 using two variations of the traditional difference score approach and compare them to the polynomial regression and response surface analysis approach. First, following tradition, I create a difference score between actual and expected FFO and estimate a regression using the difference score as a predictor. Second, I apply piecewise linear regression in an effort to estimate the predicted asymmetrical response. Third, I estimate an unconstrained polynomial regression equation using actual FFO and expected FFO as separate predictors, plot a three-dimensional response surface and test the features of the response surface.

The Constrained Linear Approach

Traditionally, the Trading volume/FFO relationship has been modeled as follows:

$$CAT = \beta_0 + \beta_1 (X - Y) + \sum_{i=1}^{k} \alpha D_i + \varepsilon \qquad (2)$$

Where CAT is the cumulative abnormal trading volume around the announcement day, (X - Y) is the algebraic unexpected FFO deflated by some measure[3] such as share price, X is actual FFO and Y is expected FFO. D represents year dummies. Expanding equation (2) results in the following:

$$CAT = \beta_0 + \beta_1 X - \beta_1 Y + \sum_{i=1}^{k} \alpha D_i + \varepsilon \qquad (3)$$

[3] A number of different deflators have been used to standardize the unexpected earning. These include share price (Cornell and Landsman, 1989; Freeman and Tse, 1992); or standard deviation of analyst forecasts (Datta and Dhillon, 1993).

Note that the model specified in equation (2) is a constrained version of a model that uses both expected and actual FFO, which can be expressed as follows:

$$CAT = \beta_0 + \beta_1 X + \beta_2 Y + \sum_{i=1}^{k} \alpha D_i + \varepsilon \tag{4}$$

Comparing equation (3) to equation (4) reveals that equation (2) constrains the coefficients in (2) to be of the same magnitude but opposite in sign (i.e. $\beta_1 = -\beta_2$). However it allows for no empirical test on whether such an assumption is supported.

The Constrained Piecewise Linear Model

I use piecewise regression according to the principles recommended by Neter et al (1996) to test for asymmetric response. First, I create a variable Z, which is set equal to 0 for positive surprises but 1 otherwise. I then use the following equation:

$$CAT = \beta_0 + \beta_1 (X - Y) + \beta_2 (X - Y) Z + \sum_{i=1}^{k} \alpha D_i + \varepsilon \tag{5}$$

Where CAT, X and Y are as defined before.

A negative and significant coefficient on β_2 would indicate a weaker response to negative than positive surprises. Accounting for asymmetric responses using the piecewise regression approach implies that the relationship between cumulative abnormal returns and unexpected FFO follows a particular linear relation in some range of unexpected FFO but follows a different linear relation

elsewhere. Specifically, I expect the slope to be stronger for positive surprises than negative surprises.

Polynomial Regression and Response Surface Analysis: The Unconstrained Approach

I test for the joint effect of expected and actual FFO on cumulative abnormal returns by estimating an equation that uses each variable separately and includes their squared and product terms to capture possible curvilinearity and asymmetry in market reaction to unexpected FFO announcement. Our model of interest, which is the unconstrained quadratic regression, has the following form;

$$CAT = \beta_0 + \beta_1 X + \beta_2 Y + \beta_3 X^2 + \beta_4 XY + \beta_5 Y^2 + \sum_{i=1}^{k} \alpha D_i + \varepsilon \qquad (6)$$

Where CAT is the cumulative abnormal return, X represents actual FFO, Y is the mean analyst estimate and D represents year dummies. Equation (5) allows for the returns-FFO relationship to be plotted in a three dimensional space enabling the examination of how the market reacts to FFO announcements under three different scenarios; (1) actual FFO is higher than expected FFO; (2) actual FFO is lower than expected FFO and (3) actual FFO is equal to expected FFO.

I examine the shape of the surface along the misfit line, which is defined by values where X=-Y. The shape along the misfit line captures the market reaction to unexpected FFO announcements, and is analogous to the unexpected earnings response coefficients in the traditional models. Substituting X = -Y into equation (5) yields the following:

$$CAT = \beta_0 + (\beta_1 - \beta_2)X + (\beta_3 - \beta_4 + \beta_5)X^2 + \varepsilon \qquad (7)$$

The term $(\beta_3 - \beta_4 + \beta_5)$ represents the curvature of the surface along the misfit line while the term $(\beta_1 - \beta_2)$ represents the slope of the surface along the misfit line both calculated at the point where X and Y equal the mean of their means.

Secondly, I examine the shape of the surface along the fit line, which represents the line along which expected and actual FFO are equal. The fit line is defined by values where X = Y and substituting this into equation (8) yields the following:

$$CAT = \beta_0 + (\beta_1 + \beta_2)X + (\beta_3 + \beta_4 + \beta_5)X^2 + \varepsilon \qquad (8)$$

The term $(\beta_3 + \beta_4 + \beta_5)$ represents the curvature of the surface along the fit line while the term $(\beta_1 + \beta_2)$ represents the slope of the surface along the fit line at a point where X and Y equal the mean of their means.

Figure 1 illustrates how the actual FFO and expected FFO relate to cumulative abnormal trading volume in a three-dimensional space. The vertical axis shows the cumulative abnormal trading volume while actual and expected FFO are represented on the x-axis and y-axis respectively. The misfit line (i.e. X = -Y) runs from the left corner to the right corner of the XY plane. The shape along the misfit line shows market responses when actual FFO deviate from expected FFO. The left side of the graph shows the market responses where actual FFO falls short of expected FFO

(negative surprises) while the right side of the graph indicates responses where actual exceeds expected FFO (positive surprises). The shape along the fit line (i.e. X = Y), which runs the near corner to the far corner, shows market responses when actual and expected FFO are equal.

Test for hypothesis 3 requires an estimation of equation (8) using expected and actual Net Income in place of FFO and comparing the variance explained to that obtained when the FFO variables are used. I use the Vuong likelihood ratio to test whether the R^2 of the FFO model is statistically different from the NI model. A significantly larger R^2 for the FFO equation will indicate a higher information content of FFO than NI providing support for hypothesis 3. Clarke (2007) shows that when the distribution of the log-likelihood ratios used in the Vuong test is highly peaked, an alternative distribution-free test provides a more efficient test. Since I do not know, a priori, the distribution of the log-likelihood ratios, I also use Clarke's simple distribution-free test in testing for difference between the two models.

Testing for an Asymmetric Response (Hypothesis 2)

Hypothesis 2 predicts stronger responses for positive surprises than negative surprises. To test this hypothesis using the unconstrained curvilinear model, I re-center each variable both at one standard deviation above its mean and one standard deviation below its mean. I calculate the slope for negative surprises by first estimating equation (7) using the actual FFO variable centered at one standard deviation below its mean and the expected FFO variable at one standard deviation above its mean and then calculating the slope using equation (8). Similarly, I calculate

the slope for positive surprise by estimating equation (7) using the actual FFO variable centered at one standard deviation above its mean and the expected FFO variable at one standard deviation below its mean and then calculate the slope using equation (8). Next, to test whether the absolute value of the slope for positive surprises is significantly greater than the slope for negative surprises, I apply bootstrapping procedures to empirically derive the sampling distribution and then construct confidence intervals around the difference in slopes. I draw 1000 bootstrap samples and use the bias corrected percentile method suggested by Stine (1989) to construct the confidence intervals.

*Test of Hypothesis 4 (*Kim and Verrecchia Hypothesis)

To test whether REITs with higher institutional holdings have less abnormal trading than those with low institutional holdings I estimate the following equation:

$$CAT = \beta_0 + \beta_6 IO + \beta_7 Z + \sum_{i=1}^{k} \alpha D_i + \varepsilon \tag{9}$$

Where *IO* is the percentage of institutional ownership in a REIT and Z is a vector of control variables including firm size, absolute cumulative abnormal return around the announcement date, and stock price. Prior studies (Ali et al (2008), Utama and Cready (1997), Atiase and Bamber (1994)) have identified these variables to be significantly related to abnormal trading volume. A significant negative coefficient on *IO* will indicate support for hypothesis 4. Since Ali et al (2008), Utama and Cready (1997) document evidence of nonlinearity in the relationship between abnormal trading and institutional holdings, I will re-estimate equation (9) by including

the square of *IO* to test whether the inverted U-shaped relationship documented in these studies hold in samples with high institutional holdings.

As documented in prior studies, I expect the coefficient on size to be negatively related to abnormal trading. This expectation is based on the premise that larger firms have greater predisclosure information making their FFO announcement less informative (Ali et al (2008), Utama and Cready (1997), Atiase and Bamber (1994)). Kim and Verrecchia (1991) hypothesize a positive relationship between abnormal trading and absolute abnormal return around the announcement date. This, coupled with the empirical evidence in a number of studies, leads me to expect a positive and significant coefficient on absolute abnormal returns. Ali et al (2008), Utama and Cready (1997) use stock price to control for the effect of transaction costs on trading volume at the announcement of earnings They posit and find a positive relationship between price and abnormal trading volume. I therefore expect to find a positive relationship between abnormal trading and stock price.

CHAPTER FOUR

RESULTS

Descriptive Statistics

Table 1 presents the descriptive statistics and correlations of the measures. The table shows that, on average, analysts' forecasts of FFO tend to be higher than actual FFO announced by REITs. Analysts' forecasts of net income (NI) also tend to be higher than the actual. Correlation between actual FFO and analyst estimates of FFO is 0.90 indicating that higher estimates are followed by higher actual FFO. The correlation between actual NI and analyst estimates is only 0.565 indicating that higher estimates of NI are not necessarily followed by higher actual NI. The mean number of analysts forecasting FFO and NI is 8 and 3 respectively. The fact that more analysts provide estimates of FFO than NI suggests that investors have a greater demand for FFO.

FFO Announcements and Abnormal Trading Volume

Tables 2 and 3 present the abnormal trading volume generated on the announcement of FFO by REITs based on two alternative definitions. As the results show, for all windows used, there is significant abnormal trading volume around the announcement dates. This suggests that the market engages in significantly more trading when REITs announce FFO irrespective of whether it misses, meets or beats the consensus forecast by analysts. The table also shows that the level of trading prior to the announcement of FFO is negative and significant in the market-based specifications suggesting that the market tends to reduce trading activity in anticipation of the FFO announcement. The pattern of abnormal trading volume prior to and around the date of the

announcement of FFO is consistent with the trading pattern around the announcement of earnings information for non-REITs. (See for example Chae, 2005)

To examine whether the level of abnormal trading volume is associated with the level of the surprise contained in the FFO announcement, I estimate three regressions. The first is based on the traditional specifications frequently used in the existing literature that uses the difference between actual FFO and expected FFO scaled by price as an independent variable to explain abnormal trading volume. The second specification modifies the first by allowing for different slopes for positive and negative surprises and use piecewise regression. Lastly, I use an unconstrained polynomial regression that allows for curvilinearity in the relation between abnormal trading volume and FFO surprises.

Table 4 presents the results based on the traditional specification. The results show that for all windows, there is no significant relationship between abnormal trading volume and the level of surprise in the announcement of FFO. This is indicated by R^2s that are not statistically different from zero. Since the traditional specification is a constrained version of the specification that uses both expected and actual FFO as independent variables, I present an unconstrained linear regression in Table 4. This allows me to formally test whether the constraints imposed by the traditional specification may be driving the results. The result of the F-test shows no significant difference in the variance explained by the traditional specification and the unconstrained version.

The results from the piecewise regression are presented in Table 5. The results show no significant relationship as indicated by the R^2s that are not statistically different from zero. In addition, tests of the difference in model R^2s show no significant difference between the piecewise regression and the traditional specifications. This suggests that the lack of association between abnormal trading volume and the size of the surprise holds when I allow for different slopes for negative and positive surprises. This is further confirmed by the insignificant coefficient on the coded variable.

I present the results based on the unconstrained polynomial regression in Table 6. The results show insignificant R^2s for all windows. An F-test for difference in R^2s for the unconstrained linear and quadratic specifications shows no significant difference. These results suggest that the lack of significant relationship between abnormal trading volume and the size of surprise is robust to different specifications.

These results are inconsistent with the findings documented for non-REITs that also use trading volume as a measure of investor response (see Bamber, 1987, Bamber and Cheon, 1995 and Cready and Hurtt, 2002). Moreover, results from a number of studies examining the information content of FFO using abnormal returns as a gauge of investor reaction have documented significant relationship between FFO surprises and abnormal returns (see Gyamfi-Yeboah, Ziobrowski and Lambert, 2010 and Baik, Billings and Morton 2008). This suggests that there may be peculiar characteristics of REITs that limits investors' ability to fully trade on the announcement of FFO surprises. Barclay, Kandel and Marx (1998) show that higher transaction

costs significantly reduce trading volume but have no effect on share prices. This suggests that in the presence of higher transaction costs, market response through share price changes could be more pronounced than changes in trading volume. It is well documented (Subrahmanyam, 2007; Bertin, Kofman, Michayluk and Prather, 2005 and Ghosh, Miles and Sirmans, 1996) that REITs have, on average, a relatively high bid-ask spread (a proxy for transaction cost) and are relatively less liquid compared to non-REITs. It is plausible to argue that the higher bid-ask spreads for REITs, which reflects a lack on consensus on prices may limit the amount of trading that occurs in response to the announcement of FFO surprises.

Information Content of Net Income vs. FFO (Test of Hypothesis 3)

To address the question of whether FFO conveys more useful information about REITs performance when compared to traditional GAAP measures, notably net income, I re-estimate all equations using net income in place of FFO. Since the evidence presented in both Downs and Guner (2006) and Baik, Billings and Morton (2008) suggest that FFO may be more useful to investors, I expect the variance explained by the regressions containing FFO to be significantly larger than those containing net income.

I present the results of the FFO versus Net Income regressions in Table 7. Since the preceding results indicate no significant relation between abnormal trading volume and FFO surprises, I use abnormal returns as the dependent variable. To ensure that the results are robust, I use two specifications: the constrained linear regression (difference score) and the unconstrained

polynomial regression. As the results show, R^2 from the regression using net income is substantially lower than the R^2 from the regression using FFO. A test for the difference in R^2 using Clarke's distribution free test shows that FFO explains significantly more variance in abnormal returns than net income supporting our conjecture that FFO provides more useful information to investors than net income.

Informed Traders and Abnormal Trading Volume (Test of Hypothesis 4)

I test Kim and Verrecchia's (1991) hypothesis that firms with more informed traders will experience less abnormal trading on the announcement of earnings (or FFO). The results of the regression testing this hypothesis are presented in Table 8. The main variable of interest is the proportion of outstanding shares held by institutions *(IO)* at the end of each quarter prior to the FFO announcement. I include control variables that have been documented in prior studies to be significantly related to abnormal trading volume. I find, as expected, that absolute abnormal returns are significantly positively related to abnormal trading volume. I also find price to be significantly related to the abnormal trading while firm size does not appear to have any significant impact. As the results in the table show, even though the proxy for the level of informed traders enters the regression with the expected sign, the coefficient is not statistically different from zero. Consistent with the approach adopted in prior studies, I include a quadratic term for *IO* but obtain the same results. This suggests that, for REITs, the level of institutional ownership does not appear to have a significant impact on the abnormal trading volume observed on the announcement of FFO. This result is in contrast to the findings documented in Kim, Krinsky and Lee (1997) and Utama and Cready (1997) for non-REITs. I speculate that the

relatively high transaction costs for REITs may limit the trading by uninformed traders who may want to trade on the announcement of FFO.

To formally test whether the results documented above are driven by the relatively higher transaction costs for REITs, I interact log price (a proxy for transaction cost) with *IO* and include this term in a regression predicting abnormal trading volume. The results are presented in Table 9. A significant and positive coefficient on the interaction term would indicate that the impact of the level of institutional ownership on abnormal trading volume depends on the level of transaction costs. Specifically, such a result would suggest that REITs with lower transaction costs and higher levels of institutional ownership are more likely to have lower volume of trading on the announcement of FFO. As the results show, the coefficient on the interaction term is positive and significant supporting the conjecture that the lack of significance on the institutional ownership variable may partly be explained by the relatively high transaction costs for REITs. Figure 2 demonstrates the relation between abnormal trading volume and the levels of institutional ownership at three different values of price: the mean, one standard deviation above the mean and below the mean. The y-axis shows cumulative abnormal trading volume while the x-axis shows the centered values for levels of institutional ownership. As the figure shows, the slope for the level of institutional ownership varies for different values of price.

Dennis and Strickland (2002) document different trading behavior for different types of institutional investors. The authors decompose institutional ownership into four categories and find some classes of institutional investors, especially mutual funds and investment advisors, to

be more active traders than other classes such as banks and insurance companies. They argue that mutual funds and investment advisors tend to "herd together and trade with the momentum". It is important to point out that after 1998, the break down of institutional ownership into the four categories is unreliable due to coding errors. As a result, the purpose of this analysis is to assess whether the use of an aggregate measure of institutional ownership is appropriate and not so much on the trading behavior of each category of institutional investors. Figure 3 shows the proportion of institutional ownership in REITs by institution type over the sample period. The average institutional ownership over the sample is about 73%. The pattern of institutional ownership is stable over the sample period with no discernable shifts in ownership patterns.

Table 10 contains the results of the analysis using two broad classifications of institutional investors: namely (1) mutual funds and investment advisor (IO_M) and (2) all other institutions (IO_A). The classification is based on the coding used in the Thompson Reuters 13(f) data. The decision to form the two groups was influenced by the findings in Dennis and Strickland (2002), which suggest that mutual funds and investment advisors may trade frequently and have a shorter holding period than pension funds, banks and insurance companies. I expect the coefficient on the IO_M variable to be positive and significant while that on IO_A is expected to be negative and significant. As the results show, there is a significant and positive relationship between the level of holdings by mutual funds and investment advisors and the level of abnormal trading volume around FFO announcement. I also find a significant negative relationship at the 10% level between the level of ownership by other institutional investors (pension funds & endowments, banks and insurance) and the level of abnormal trading volume around the announcement of

FFO. Taken together, these and the previous results using aggregated institutional ownership variable suggest that institutional investors are not homogeneous and may therefore exhibit different trading behaviors. The results also indicate that the use of an aggregate measure of institutional ownership as proxy for informed traders to test hypotheses such as Kim and Verracchia's has the potential of masking the predicted relationships. These results bring into question the appropriateness of using aggregate institutional ownership as a proxy for informed traders since as Downs and Guner (1999) note investors may trade for reasons other than informational advantage.

Robustness checks

To assess the robustness of the results, I carry out analyses based on FFO announcements between 1997 and 1999. Tables 11 and 12 contain the cumulative abnormal trading volume around the announcement of FFO. In contrast to the results for 200 -2006 period, investors appear not to engage in significantly more trading on the announcement of FFO except for positive surprises when abnormal trading volume is measured based on firm specific data. The market-based measure is, however, generally consistent with the 2004 -2006 results. To examine whether the level of abnormal trading volume is related to the surprise contained in the FFO announcement, I use three different specifications. The results are presented in Tables 13, 14, 15 for the difference score, piecewise regression and polynomial regression specifications respectively. In all three specifications, there is no significant relationship between the level of abnormal trading volume around the announcement of FFO and the surprise contained in the announcement. Additional analyses (for both 2004 -2006 and 1997 – 1999 sample periods) that

include an interaction variable created between the time dummies and FFO surprises show no significant time variation in the relation between cumulative abnormal trading volume and FFO surprises.

I also examine the impact informed traders have on the levels of abnormal trading volume for the 1997 -1999 sample period. Figure 4 shows the proportion of REITs shares held by the different categories of institutional investors. On average, institutions held about 52% of REIT outstanding shares over this period. Note that the pattern of institutional ownership by category experienced a significant shift during the first quarter of 1999. Prior to this time, mutual funds and investment advisors held a significant majority of REIT shares. Even though the total number of shares held by institutions in the aggregate did not significantly change after the first quarter of 1999, mutual funds and investment advisors significantly reduced their stakes in REITs while pension funds and endowment appear to have taken up the shares previously held by mutual funds and investment advisors. The apparent shift in ownership among institutions may be the result of coding errors that occurred around this time. As a result of this shift in ownership among institutions, I create an indicator variable to control for any impact the shift in ownership pattern may have on the results.

The first set of results, presented in Table 16, examines how institutions in the aggregate impact the level of abnormal trading volume. There is no significant relationship between the proportion of shares held by institutions and abnormal of trading volume on the announcement of FFO confirming the earlier results. The results, using two broad classifications of institutional investors: namely mutual funds and investment advisors and all other institutions are presented

in Table 17. The results indicate no significant relationship between any of the institutional categories and abnormal trading volume. To control for the shift in ownership that occurred in the first quarter of 1999, I create an indicator variable, which is coded 1 for ownership post 1999 first quarter and 0 otherwise. I then create an interaction variable between the two categories of ownership and the indicator variable.

The results, which are presented in Table 18, show that even though there is a significant positive relationship between holdings by other institutions (pension funds, banks and insurance), the relationship is significantly lower after 1999. The coefficient on ownership by mutual funds and investment advisors is not significant. These results, even though in contrast to those for the 2004 to 2006 sample period[4], suggest that institutional investors are heterogeneous in their trading behaviors. It may therefore be inappropriate to use an aggregate measure of institutional ownership in examining the trading behavior of institutions.

Lastly, to examine whether the coefficient on institutional ownership is time varying I interact the time dummies with the institutional ownership variable. The results of the regression analysis show no significant relation between the interaction variable and cumulative abnormal trading volume. This suggests that the lack of association between the levels of institutional ownership (in the aggregate) and abnormal trading volume around the announcement of FFO is not time varying.

[4] The difference in results may be due to coding errors in the institution type data noted earlier.

Dispersions in Analysts' Forecast and Abnormal Trading Volume

In addition to using the proportion of institutional ownership as a proxy for the number of informed traders to test Kim and Verracchia's hypothesis, a number of researchers have examined how other measures of predisclosure uncertainty affect the level of abnormal trading volume around the announcement of earnings (see Bamber, Barron and Stober, 1997, Atiase and Bamber, 1994). A measure that has frequently been used in the literature is the dispersion in analysts' forecast prior to the announcement. But as already noted in the literature review section, this measure may reflect divergent expectations among analysts and not necessarily differences in the quality of predisclosure information as the theoretical proposition predicts. Bamber, Barron and Stober, (1997) drawing support from Barron, Kim, Lim and Stevens (1997), argue that Kim and Verracchia's model supports the conjecture that trading volume will be positively related to dispersion in analysts' forecasts.

Notwithstanding this limitation, the dispersion in analysts' forecasts has been found to be positively related to the level of abnormal trading volume (Bamber, Barron and Stober, 1997, Atiase and Bamber, 1994). This suggests that higher levels of disagreement among analysts should result in greater levels of trading on the announcement of earnings (FFO). As a further test of robustness, I regress the abnormal trading volume on the dispersion in analysts' forecast and report the results in Table 19. There is a significant and positive relationship between the level of dispersion in analysts' forecasts and the level of abnormal trading volume around the announcement of FFO. The coefficients on the control variables are generally as expected and documented in our previous results using the proportion of institutional ownership.

CHAPTER 5

CONCLUSION AND FUTURE RESEARCH IDEAS

Conclusion

A fundamental question that has been addressed quite extensively in accounting, finance and real estate literature is whether investors respond significantly to the announcement of earnings or cash flow measures such as funds from operations (FFO). The premise of this question is that if financial markets are efficient and earnings information is indeed central to the pricing of stocks then investors should respond to the announcement of earnings or FFO surprises and lead to abnormal trading returns or trading volume. In this dissertation, I examine the market reaction to the announcement of FFO by REITs using abnormal trading volume as a gauge of investors' reaction. I also address the question of whether FFO provides more useful information to investors than net income. Lastly, I assess the impact that institutional investors have on the level of abnormal trading observed on the announcement of FFO.

To examine whether the level of abnormal trading volume is associated with the size of the surprise contained in the FFO announcement, I estimate three regressions. The first is based on the traditional specifications frequently used in the existing literature that uses the difference between actual FFO and expected FFO scaled by price as an independent variable explaining abnormal trading volume. The second specification modifies the first by allowing for different slopes for positive and negative surprises and use piecewise regression. Lastly, I use an

unconstrained polynomial regression that allows for curvilinearity in the relation between abnormal trading volume and FFO surprises.

The results indicate that even though the announcement of FFO leads to abnormal trading, there is no association between the level of abnormal trading volume and the size of the surprise contained in the FFO announcement. This is in contrast to the evidence documented in the literature for non-REITs (Bamber, 1987, Bamber and Cheon, 1995 and Cready and Hurtt, 2002). A plausible explanation for the results is the relatively high transaction costs associated with REITs. Consistent with the findings in Barclay, Kandel and Marx (1998), I posit that in the presence of higher transaction costs, market response through share price changes could be more pronounced than changes in trading volume. I also find, using abnormal returns as a measure of investor response, that FFO explains significantly more variance in abnormal returns than net income suggesting that FFO provides more useful information than net income.

I use the proportion of institutional holdings as a proxy for the number of informed traders to predict the amount of abnormal trading volume. I find no significant relation between abnormal trading volume and the proportion of institutional holdings. This also contrasts sharply with the findings for non-REITs. This is also inconsistent with the predictions in Kim and Verracchia (1991) and may partly be explained by the relatively high transaction cost for REIT. To further assess how different categories of institutional investors react to the announcement of FFO, I classify institutions into two broad classifications; namely (1) mutual funds and investment advisor and (2) all other institutions. I find that the level of abnormal trading volume is

significantly positively related to the holdings by mutual funds and investment advisors but negatively related to the holdings of other institutions (pension funds &.endowments, banks and insurance companies). This raises questions of whether the use of an aggregate measure of institutional ownership is appropriate in studies that examine the effect of institutional holdings.

Finally, I use the dispersion in analysts' forecasts, a measure of predisclosure uncertainty to predict the level of abnormal trading volume around the announcement of FFO and find a significant and positive relationship between the level of dispersion in analysts' forecast and the level of abnormal trading volume around the announcement of FFO. This finding suggests that a REIT with less analysts' consensus on expected FFO is more likely to experience more intense trading around the announcement date.

Future Research Ideas

In this dissertation, I show that trading volume does not appear to fully capture investors' reaction to the announcement of FFO by REITs suggesting that use of stock price changes may better reflect investors' responses. I attribute the lack of association between abnormal trading volume and the size of FFO surprises partly to the relatively high transaction costs of REITs. A future study that examines more closely the nature and extent of transaction cost constraints will provide useful extensions to the literature. In this regard, alternative measures of transaction costs could be used to enable more robust conclusions to be drawn.

I also show that FFO provides more information to investors compared to net income using a sample of equity REITs. It is arguable that for mortgage REITs, the distinction between FFO and net income would be less pronounced. A future study that looks at the relative information content of FFO and net income within the context of mortgage REITs will likely shed light on the extent investors view the distorting nature of depreciation.

Finally, I show that the use of an aggregate measure of institutional ownership as a proxy for informed investors may be inappropriate given the heterogeneous nature of different institution types. A future study that uses disaggregated data and overcomes the coding errors in the Thompson Reuters data could provide new insights into the trading behavior of different institution. This will help to clarify which of the institutions may represent a better proxy for informed traders.

Table 1: Descriptive Statistics and Correlations among measure

	Means and standard deviations		Correlation Matrix			
	M	sd	Actual FFO	Exp. FFO	Actual NI	Exp. NI
Actual FFO	0.563	0.336				
Expected FFO	0.569	0.291	0.903			
Actual NI	0.263	0.261	0.547	0.461		
Expected NI	0.306	0.454	0.493	0.528	0.565	

This table reports the summary statistics and the correlations among actual FFO; actual Net Income (NI) expected FFO and Expected Net Income (NI). All FFO and NI numbers are in US$ per share. The sample consists of 1147 announcements of FFO and NI by REITs listed on the NYSE and AMEX between 2004 and 2006.

Table 2: Abnormal Trading Volume around the announcement of FFO

	Number of Observations	-10, -3	-5, 1	-2, 2	-1, 1
CAT for Positive Surprises (%)	529	-2.20	56.16***	32.50***	17.95***
CAT for Zero Surprises (%)	248	-7.38	34.40***	17.82***	8.58**
CAT for Negative Surprises (%)	370	-11.13	59.27***	31.47***	20.24***

This table reports the cumulative abnormal trading volume around the announcement of FFO by REITs listed on the NYSE and AMEX between 2004 and 2006 and the number of observations. The cumulative abnormal trading volume is estimated as the difference between log turnover and average turnover over an estimation period of 30 days ending 11 days prior to the event. Turnover is defined as trading volume divided by shares outstanding. The columns labeled (-10, -3), (-5, 1), (-2. 2)and (-1, 1) are the cumulative abnormal trading volume over the 8 days prior to the announcement, 7, 5 and 3 days around FFO announcements respectively.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 3: Abnormal Trading Volume around the announcement of FFO – Robustness Check

	Obs.	-10, -3	-5, 1	-2, 2	-1, 1
CAT for Positive Surprises (%)	529	-53.21***	102.73***	58.83***	37.84***
CAT for Zero Surprises (%)	248	-60.11***	60.29***	35.91***	22.27***
CAT for Negative Surprises (%)	370	-74.00***	112.5***	64.65***	46.37***

This table reports the cumulative abnormal trading volume around the announcement of FFO by REITs listed on the NYSE and AMEX between 2004 and 2006 and the number of observations. The cumulative abnormal trading volume are estimated based on the market model using the value-weighted daily trading volume data from CRSP and an estimation period of 30 days ending 11 days prior to the event. The columns labeled (-10, -3), (-5, 1), (-2. 2)and (-1, 1) are the cumulative abnormal trading volume over the 8 days prior to the announcement, 7, 5 and 3 days around FFO announcements respectively.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 4: Linear regression estimates of the association between FFO surprises and cumulative abnormal trading volume

	Constrained Equation			Unconstrained Equation					
	(X – Y)	R^2	*Adj.* R^2	X	Y	R^2	*Adj.* R^2	F_C	F_H
CAT 7	-0.769	0.005	0.002	-0.219	0.234	0.005	0.002	0.163	0.188
CAT 5	-0.389	0.002	0.000	-0.133	0.145	0.002	-0.001	0.928	0.611
CAT 3	-1.884	0.002	0.000	-0.169	0.204	0.003	0.000	0.792	0.476

This table reports the results of the regression analysis for the difference score model (equation (2) - the constrained equation) and its corresponding unconstrained version (equation (4).

$$CAT = \beta_0 + \beta_1 (X - Y) + \sum_{i=1}^{k} \alpha D_i + \varepsilon \qquad (2)$$

$$CAT = \beta_0 + \beta_1 X + \beta_2 Y + \sum_{i=1}^{k} \alpha D_i + \varepsilon \qquad (4)$$

For columns labeled (X-Y), X, and Y, values represent unstandardized regression coefficients from equations in which X is the actual FFO, Y is the expected FFO and the dependent variable (CAT) is the cumulative abnormal trading volume around the announcement date. The column F_c presents the F-ratios for the test of the constraints imposed by the algebraic difference score (the constrained equation), which is equivalent to the test of the difference in R^2 values for the constrained and unconstrained equations (df 1, N-3). The column labeled F_H presents F-ratios for the test of higher order terms in a quadratic equation i.e X^2, XY and Y^2 (d.f 3, N-5). CAT7, CAT5, and CAT3 are the 7 day, 5 day and 3 day cumulative abnormal returns respectively.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 5: The Constrained Piecewise Linear Regression estimates of the association between FFO surprises and cumulative abnormal trading volume

	X - Y	(X –Y)Z	R^2	*Adj.* R^2
CAT 7	0.140	-0.390	0.006	0.002
CAT 5	0.512	-0.702	0.003	0.000
CAT 3	0.239	-0.440	0.003	0.000

This table reports the results of the regression analysis for the difference score combined with piecewise regression model (equation (5).

$$CAT = \beta_0 + \beta_1 (X - Y) + \beta_2 (X - Y) Z + \sum_{i=1}^{k} \alpha D_i + \varepsilon \qquad (5)$$

Columns labeled (X-Y) and(X-Y)Z are unstandardized regression coefficients where X is the actual FFO, Y is the expected FFO and Z is an indicator variable set to 0 for positive surprises/no surprise but 1 for negative surprises .The dependent variable (CAT) is the cumulative abnormal trading volume around the announcement date.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 6: Unconstrained Polynomial Regression estimates of the association between FFO surprises and cumulative abnormal trading volume

	X	Y	X^2	XY	Y^2	R^2	*Adj.* R^2
CAT7	-1.026**	1.052**	-0.392	0.413	0.168	0.009	0.003
CAT5	-0.867**	0.867**	-0.364**	0.520	0.051	0.008	0.002
CAT3	-0.737***	-0.781***	-0.301**	0.763	-0.361	0.009	0.003

This table reports the results of the regression analysis for the unconstrained polynomial regression (equation 6).

$$CAT = \beta_0 + \beta_1 X + \beta_2 Y + \beta_3 X^2 + \beta_4 XY + \beta_5 Y^2 + \sum_{i=1}^{k} \alpha D_i + \varepsilon \qquad (6)$$

For columns labeled X, Y, X^2, XY and Y^2 values represent unstandardized regression coefficients from equations in which X is the actual FFO, Y is the expected FFO and the dependent variable (CAT) is the cumulative abnormal trading volume around the announcement date. CAT7, CAT5, and CAT3 are the 7 day, 5 day and 3 day cumulative abnormal trading volume respectively.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 7: Comparison of FFO vs. Net Income

Model	Measure	R^2	Vuong Test	Clarke's Test
Constrained Linear	FFO	0.018***		
	NI	0.004	-1.301	342***
Unconstrained Quadratic	FFO	0.029 ***		
	NI	0.014 **	-1.106	447***

This table reports the R^2 from the regression analysis for the constrained linear (equation 2) and unconstrained quadratic regression equation (equation 6) for FFO and net income (NI).

$$CAT = \beta_0 + \beta_1 (X - Y) + \sum_{i=1}^{k} \alpha D_i + \varepsilon \qquad (2)$$

$$CAT = \beta_0 + \beta_1 X + \beta_2 Y + \beta_3 X^2 + \beta_4 XY + \beta_5 Y^2 + \sum_{i=1}^{k} \alpha D_i + \varepsilon \qquad (6)$$

Where X is the actual FFO (NI), Y is the expected FFO (NI) and the dependent variable (CAT) is the cumulative abnormal trading volume around the announcement date

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 8: OLS regression estimates of the impact of institutional ownership on abnormal trading volume

Variable	**Coefficient**
Constant	-0.525**
Absolute abnormal return	9.497***
Price	0.192**
Size	0.023
Institutional ownership	-0.094
Adjusted R^2	0.047***

This table reports the results of the regression analysis testing for the impact of institutional ownership on abnormal trading volume around the announcement of FFO. The dependent variable is the 7 day cumulative abnormal trading volume and defined as the difference between log turnover and average turnover over an estimation period of 30 days ending 11 days prior to the event.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 9: OLS regression estimates of effect of transaction cost on the relation between institutional ownership and abnormal trading volume

Variable	**Coefficient**
Constant	0.023
Absolute abnormal return	9.455***
Price	0.184**
Size	0.026
Institutional ownership *(IO)*	-0.004
IOPrice	0.369*
Adjusted R^2	0.051***

This table reports the results of the regression analysis testing for the impact of institutional ownership on abnormal trading volume around the announcement of FFO conditioned on price (a proxy for transaction cost). The dependent variable is the 7 day cumulative abnormal trading volume defined as difference between log turnover and average turnover over an estimation period of 30 days ending 11 days prior to the event

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 10: OLS regression estimates of association between institutional ownership type and abnormal trading volume

Variable	**Coefficient**
Constant	-0.663
Absolute abnormal return	0.088***
Price	0.171*
Size	0.049
Mutual funds/investment advisors *(IO_M)*	1.688***
Other Institutions *(IO_A)*	-0.370*
Adjusted R^2	0.055***

This table reports the results of the regression analysis testing for the impact of institutional ownership on abnormal trading volume around the announcement of FFO using two broad classifications of institutional investors: mutual funds and investment advisors in one group and all others in another. The dependent variable is the 7 day cumulative abnormal trading volume defined as the difference between log turnover and average turnover over an estimation period of 30 days ending 11 days prior to the event.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 11: Abnormal trading volume around the announcement of FFO: 1997 -1999

	Number of Observations	-10, 3	-5, 1	-2, 2	-1, 1
CAT for Positive Surprises (%)	387	-6.53	16.49**	12.77**	10.22***
CAT for Zero Surprises (%)	270	-14.25	5.92	4.14	3.86
CAT for Negative Surprises (%)	179	-1.03	17.27	8.77	7.42

This table reports the cumulative abnormal trading volume around the announcement of unexpected FFO by REITs listed on the NYSE and AMEX between 1997 and 1999 and the number of observations. The cumulative abnormal trading volume is estimated as the difference between log turnover and average turnover over an estimation period of 30 days ending 11 days prior to the event. Turnover is defined as trading volume divided by shares outstanding. The columns labeled (-10, -3), (-5, 1), (-2. 2)and (-1, 1) are the cumulative abnormal trading volume over the 8 days prior to the announcement, 7, 5 and 3 days around FFO announcements respectively.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 12: Abnormal trading volume around the announcement of FFO: 1997 - 1999 Robustness Check

	Number of observations	-10, -3	-5, 1	-2, 2	-1, 1
CAT for Positive Surprises (%)	387	-48.77***	27.11***	16.52***	19.02***
CAT for Zero Surprises (%)	270	-66.04***	-7.14	-10.02**	-2.56*
CAT for Negative Surprises (%)	179	-49.45***	26.57***	9.00**	9.63**

This table reports the cumulative abnormal trading volume around the announcement of unexpected FFO by REITs listed on the NYSE and AMEX between 1997 and 1999 and the number of observations. The cumulative abnormal trading volume are estimated based on the market model using the value-weighted daily trading volume data from CRSP and an estimation period of 30 days ending 11 days prior to the event. The columns labeled (-10, -3), (-5, 1), (-2. 2)and (-1, 1) are the cumulative abnormal trading volume over the 8 days prior to the announcement, 7, 5 and 3 days around FFO announcements respectively.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 13: Linear regression estimates of the association between FFO surprises and cumulative abnormal trading volume: 1997 -1999

	Constrained Equation			Unconstrained Equation					
	(X – Y)	R^2	*Adj.* R^2	X	Y	R^2	*Adj.* R^2	F_C	F_H
CAT 7	3.851	0.000	-0.001	-0.688	1.381	0.007	0.004	0.744	0.872
CAT 5	18.226	0.002	0.000	0.596	-0.261	0.003	0.001	0.682	0.761
CAT 3	13.511	0.002	0.001	0.592	-0.374	0.003	0.001	0.786	0.741

This table reports the results of the regression analysis for the difference score model (equation (2) - the constrained equation) and its corresponding unconstrained version (equation (4).

$$CAT = \beta_0 + \beta_1 (X - Y) + \sum_{i=1}^{k} \alpha D_i + \varepsilon \qquad (2)$$

$$CAT = \beta_0 + \beta_1 X + \beta_2 Y + \sum_{i=1}^{k} \alpha D_i + \varepsilon \qquad (4)$$

For columns labeled (X-Y), X, and Y, values represent unstandardized regression coefficients from equations in which X is the actual FFO, Y is the expected FFO and the dependent variable (CAT) is the cumulative abnormal trading volume around the announcement date. The column F_c presents the F-ratios for the test of the constraints imposed by the algebraic difference score (the constrained equation), which is equivalent to the test of the difference in R^2 values for the constrained and unconstrained equations (df 1, N-3). The column labeled F_H presents F-ratios for the test of higher order terms in a quadratic equation i.e X^2, XY and Y^2 (d.f 3, N-5). CAT7, CAT5, and CAT3 are the 7 day, 5 day and 3 day cumulative abnormal returns respectively.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 14: The Constrained Piecewise Linear Regression estimates of the association between FFO surprises and cumulative abnormal trading volume: 1997 -1999

	X - Y	(X –Y)Z	R^2	*Adj.* R^2
CAT 7	0.140	-1.135	0.000	-0.002
CAT 5	1.322	-1.086	0.001	-0.002
CAT 3	0.928	-0.481	0.001	-0.001

This table reports the results of the regression analysis for the difference score combined with piecewise regression model (equation (5).

$$CAT = \beta_0 + \beta_1 (X - Y) + \beta_2 (X - Y) Z + \sum_{i=1}^{k} \alpha D_i + \varepsilon \qquad (5)$$

Columns labeled (X-Y) and(X-Y)Z are unstandardized regression coefficients where X is the actual FFO, Y is the expected FFO and Z is an indicator variable set to 0 for positive surprises/no surprise but 1 for negative surprises .The dependent variable (CAT) is the cumulative abnormal trading volume around the announcement date.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 15: Unconstrained Polynomial Regression estimates of the association between FFO surprises and cumulative abnormal trading volume: 1997-1999

	X	Y	X^2	XY	Y^2	R^2	*Adj.* R^2
CAT7	-0.475	1.195	4.520	-16.243	11.870	0.007	0.001
CAT5	0.731	-0.351	3.680	-15.144	11.310	0.004	-0.002
CAT3	0.554	-0.304	1.158	-8.633	7.441	0.005	-0.001

This table reports the results of the regression analysis for the unconstrained polynomial regression (equation 6).

$$CAT = \beta_0 + \beta_1 X + \beta_2 Y + \beta_3 X^2 + \beta_4 XY + \beta_5 Y^2 + \sum_{i=1}^{k} \alpha D_i + \varepsilon \qquad (6)$$

For columns labeled X, Y, X^2, XY and Y^2 values represent unstandardized regression coefficients from equations in which X is the actual FFO, Y is the expected FFO and the dependent variable (CAT) is the cumulative abnormal trading volume around the announcement date. CAT7, CAT5, and CAT3 are the 7 day, 5 day and 3 day cumulative abnormal trading volume respectively.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 16: OLS regression estimates of the association between institutional ownership and abnormal trading volume: 1997-1999

Variable	**Coefficient**
Constant	-0.750**
Absolute abnormal return	0.103***
Price	0.308**
Size	-0.074
Institutional ownership	0.145
Adjusted R^2	0.048***

This table reports the results of the regression analysis testing for the impact of institutional investors on abnormal trading volume around the announcement of FFO. The dependent variable is the 5 day cumulative abnormal trading volume and is defined as the difference between log turnover and average turnover over an estimation period of 30 days ending 11 days prior to the event.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 17: OLS regression estimates of association between institutional ownership type and abnormal trading volume: 1997-1999

Variable	**Coefficient**
Constant	-0.766**
Absolute abnormal return	0.102***
Price	0.347*
Size	-0.093
Mutual funds/investment advisors *(IO_M)*	0.048
Other Institutions *(IO_A)*	0.293
Adjusted R^2	0.049***

This table reports the results of the regression analysis testing for the impact of informed traders on abnormal trading volume around the announcement of FFO using two broad classifications of institutional investors: mutual funds and investment advisors in one group and all others in another. The dependent variable is the 5 day cumulative abnormal trading volume.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 18: OLS regression estimates of association between institutional ownership type and abnormal trading volume after controlling for shifts in ownership patterns: 1997 – 1999

Variable	**Coefficient**
Constant	-0.398
Absolute abnormal return	0.100***
Price	0.389***
Size	- 0.125**
Dummy 99	0.015
Mutual funds/investment advisors *(IO_M)*	-0.134
IOM/Dummy99	1.302
Others *(IO_A)*	1.574***
IO_A/Dummy99	1.340**
Adjusted R^2	0.051***

This table reports the results of the regression analysis testing for the impact of informed traders on abnormal trading volume around the announcement of FFO using four classifications on institutional investors. The dependent variable is the 5 day cumulative abnormal trading volume and is defined as the difference between log turnover and average turnover over an estimation period of 30 days ending 11 days prior to the event.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Table 19: OLS estimates of the relation between dispersion in analysts' forecast and abnormal trading volume: 2004 – 2006

Variable	Coefficient
Constant	-0.734
Absolute abnormal returns	0.085***
Price	0.159***
Size	0.024
Dispersion in analysts' forecast	1.985***
Adjusted R^2	0.074***

This table reports the results of the regression analysis testing for the impact of dispersion in analysts' forecast on abnormal trading volume around the announcement of FFO. The dependent variable is the 5 day cumulative abnormal trading volume is defined as difference between log turnover and average turnover over an estimation period of 30 days ending 11 days prior to the event.

*** indicates statistical significance based on a two-tailed test at the 1% level.

** indicates statistical significance based on a two-tailed test at the 5% level

* indicates statistical significance based on a two-tailed test at the 10% level

Figure 1: A graph showing how abnormal trading volume relates to actual and expected FFO in a three-dimension space

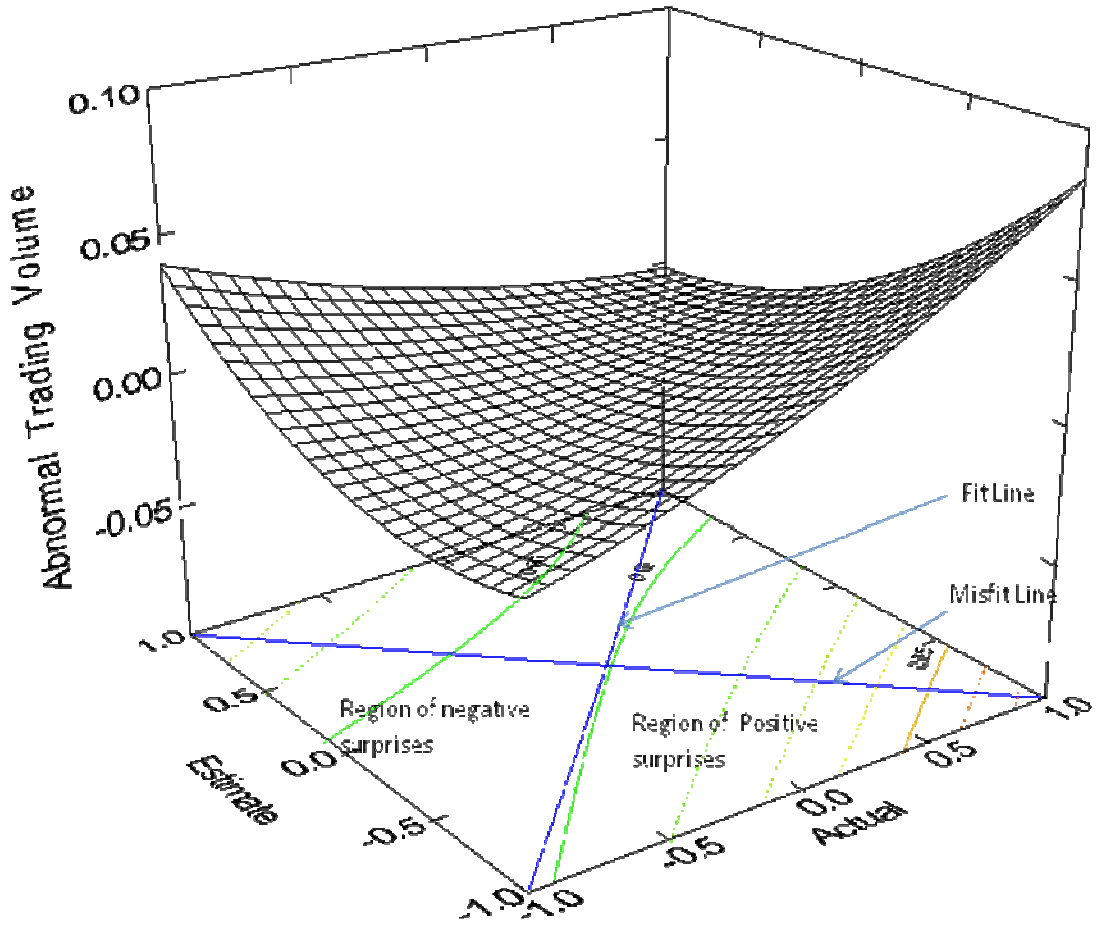


Figure 2: Graph showing the effect of price (transaction cost) on the relation between abnormal trading volume and the level of institutional ownership

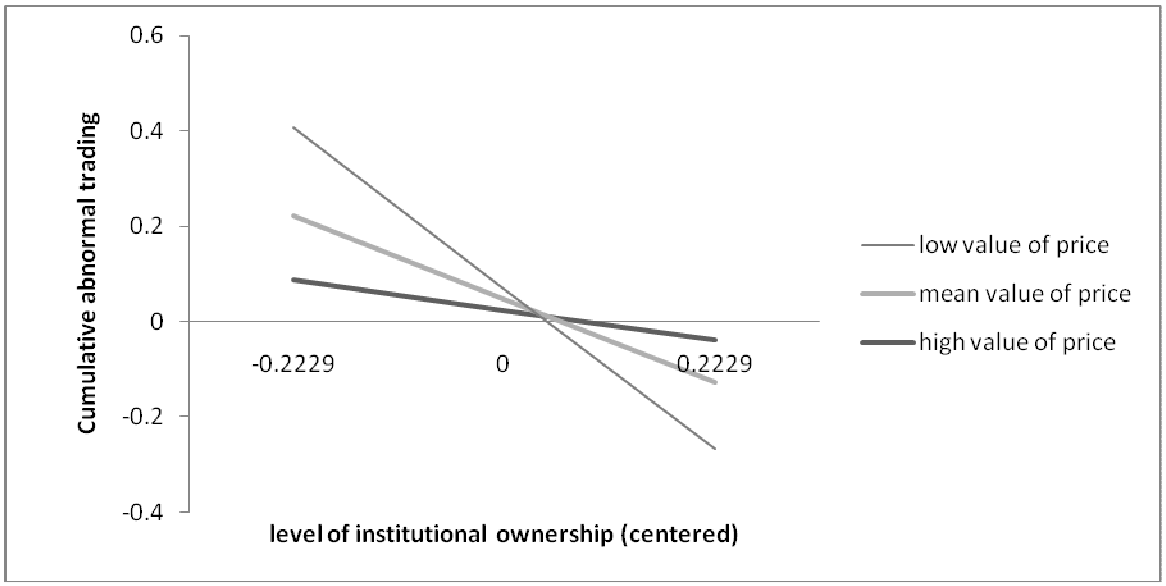


Figure 3: Institutional Ownership 2004 -2006

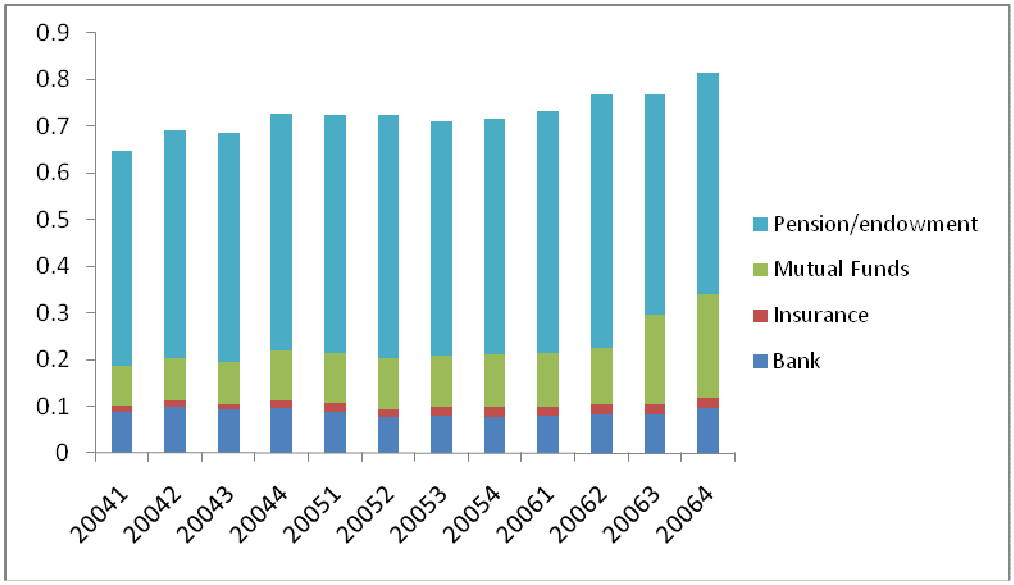
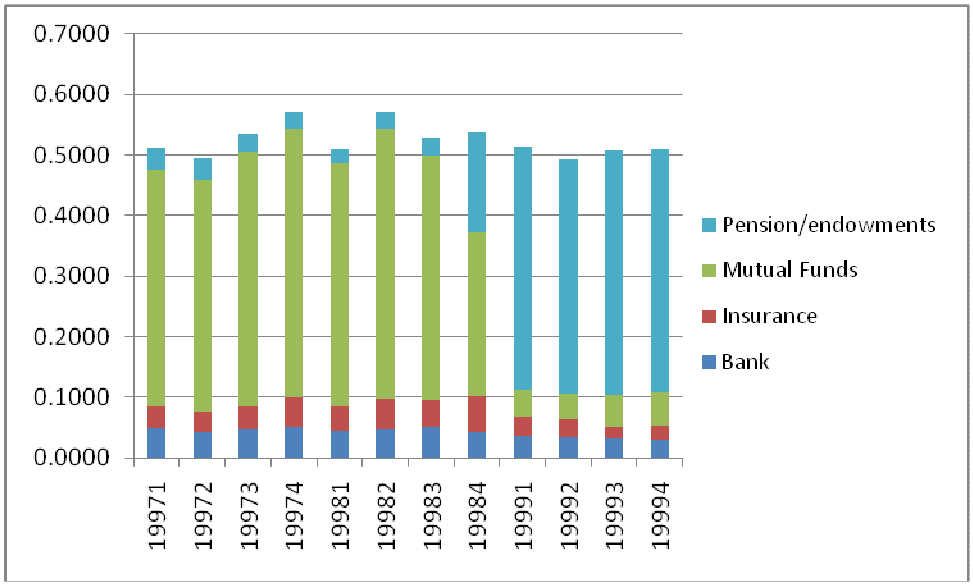


Figure 4: Institutional Ownership: 1997-1999



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Vita

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In addition to being a lecturer, Frank worked as a consultant on a number of real estate projects. Notably, he developed the concept and conducted market research for the proposed housing project by Databank Financial Services Ltd in Accra, Ghana.

Frank Gyamfi-Yeboah has presented papers at both the regular and doctoral sessions of the American Real Estate Society (ARES) and American Real Estate and Urban Economics Association (AREUEA) meetings. He has published in a number of journals including the Journal of Real Estate Finance and Economics.