

UNIVERSITY OF WAIKATO

**Hamilton
New Zealand**

**Corporate Governance, Information Uncertainty and
Market Reaction to Information Signals**

Nawaf Almaskati, Ron Bird, Yue Lu and Danny Yeung

Working Paper in Economics 15/19

July 2019

Corresponding Author

Nawaf Almaskati (nawafmask@hotmail.com)

Ron Bird (ronbird@waikato.ac.nz)

Yue Lu (susanna.lu@waikato.ac.nz)

School of Accounting, Finance and Economics

University of Waikato

Private Bag 3105

Hamilton 3240

NEW ZEALAND

Danny Leung (danny.yeung-1@uts.edu.au)

University of Technology

Sydney

AUSTRALIA

Abstract

We examine whether the reaction of investors to earnings announcements is influenced by a firm's governance profile. We find that firms with better governance characteristics experience a larger initial reaction to both good and bad earnings announcements regardless of the prevailing sentiment and uncertainty conditions. However, the influence of governance is constrained to the announcement period and becomes insignificant during the post-announcement period. In contrast, we demonstrate that changes in market uncertainty and/or investor sentiment are related to the post earnings announcement drift suggesting that investors only return to reconsider their initial reaction to an announcement when there is a change in the conditions that influenced their reaction in the first place. We find that the major channel through which greater corporate governance influences the market response to unexpected earnings news is via lowering information uncertainty and so increasing the credibility of the information provided. Finally, we establish that the two types of uncertainty (market and information) analysed in this paper have very different influence on investor response to information signals.

JEL Classification

D81; G10; G14; G30; G32

Key Words

corporate governance
uncertainty
sentiment
information uncertainty
post-earnings-announcement-drift
information signals

1. Introduction

Every day, investors process vast amounts of data and information signals in their attempt to find the true value of particular stocks. Whenever a new piece of information is released, investors try to predict the potential implications of such information for the value of the company. However, the process of interpreting information signals is not straightforward but rather susceptible to factors such as the prevailing market sentiment and uncertainty as well as the perceived quality of the information signal itself. Put differently, upon receiving a new piece of information, investors do not always update their beliefs and expectations about the value of a stock in a fully rational or a standard Bayesian fashion but rather get influenced by several market-wide and firm-specific factors that introduce some bias into the process (Brav and Heaton 2002, Epstein and Schneider 2008).

Prior evidence in the literature suggests that factors such as: market-wide uncertainty (Williams 2015), firm-specific uncertainty (Francis *et al.* 2007), and investors' beliefs and sentiment (Bird and Yeung 2012, Kumar 2009, Pevzner *et al.* 2015), impact investors' response to new information. For instance, investors tend to underreact initially to imprecise or uncertain information signals, although this underreaction may be corrected if the uncertainty is subsequently resolved (Brav and Heaton 2002 Francis *et al.* 2007, Zhang 2006). Empirical findings with regards to the effect of market-wide (or macro) uncertainty (Bird and Yeung, 2012, Williams 2015) and firm-specific (or micro) uncertainty (Francis *et al.* 2007, Zhang 2006) on processing information signals support this proposition. Prior findings in the literature have also linked investors' reactions under uncertainty to their sentiment and beliefs about the market. For instance, Kumar (2009) finds that individual investors display stronger behavioural biases such as overconfidence about stock values when uncertainty at the firm and/or market level is high. Furthermore, Bird and Yeung (2012) and Bird *et al.* (2014) show that positive market sentiment mitigates the effect of high uncertainty on investors' reactions to earnings announcements.

A relatively recent stream of research has focused on examining the relationship between the firm's corporate governance characteristics and market participants' reaction to the different events and news. Findings from past studies suggest that governance mechanisms help reduce information uncertainty through different means, such as: increasing voluntary disclosures (Beekes and Brown 2006, Beekes *et al.* 2016), enhancing the quality of information (Bhat *et al.* 2006, Cai *et al.* 2006), and reducing information asymmetry (Kanagaretnam *et al.* 2007).

The important contribution of this study is to extend the previous literature by examining the role of corporate governance mechanisms in influencing investors' initial and subsequent reactions to earnings announcements, with special attention to one of the most persistent market anomalies, namely the post-earnings announcement drift (PEAD). When investigating the relationship between corporate governance and investor response to earnings announcements, we

control for market conditions that have been found to impact on this response with a particular focus on market uncertainty and investor sentiment. While several explanations for the PEAD based on the rational expectations model or some behavioural observations are provided in the literature (see Bartov *et al.* 2000, Mendenhall 2004, Sadka 2006), the prevailing market conditions such as market uncertainty and investor sentiment have received increasing attention in recent years as possible contributing factors to the PEAD (Bird *et al.* 2014, Bird and Yeung 2012, Francis *et al.* 2007, Ozoguz 2009, Williams 2015). This study is the first to look at the nexus between corporate governance, market uncertainty, investor sentiment, and the PEAD, and adds to a growing stream of research focusing on increasing our understanding of the response of market participants to different types of news and events. The study also supplements previous attempts to understand the initial and subsequent market response to earnings releases by providing evidence on the contributing role played by corporate governance through the effect that it has on information uncertainty.

In a sample of quarterly announcements made by US public firms between January 2006 and December 2016, we find that better governance significantly strengthens the magnitude of the initial market reaction to both positive and negative earnings announcements. This contrasts with the impact of either market uncertainty or investor sentiment which will have a different effect depending on whether the response is to good news or bad news. For example, higher uncertainty will cause pessimism in the minds of investors which result in a greater response to bad news but a weaker response to good news. An important finding is that the level of governance plays no role in explaining movements in share prices during the post-announcement period that are attributable to any reassessment of the initial announcement. This contrasts with the findings for uncertainty and sentiment which both are found to have an on-going influence on the market response to an earnings announcement during the post-announcement period. Significantly, it is changes in either the level of uncertainty and sentiment, and not the level itself, that explain the post-announcement drift. The implication is that corporate governance plays no role in explaining the PEAD because it remains relatively stable over the post-announcement period.

Our findings suggest that the immediate impact of an earnings announcement on investor expectations is conditioned by the environment existing at the time of the announcements which is defined by a number of factors including the level of corporate governance, market uncertainty and investor sentiment. One of our more important findings is that investors only revisit their initial response to an earnings announcement if there is a change in this environment. This brings into question an interpretation that the PEAD is an inevitable correction to an initial underreaction to earnings news (for example, Zhang 2006). Our findings suggest that any such a correction is not inevitable but rather is a response to post-announcement movements in factors such as market uncertainty and sentiment. The wider implication being that the process by which

securities are driven towards efficient pricing is continually being bombarded by distorting factors that may well result in extended periods of mispricing.

There are at least two additional important insights that stem from our analysis. First, we identify the major channel through which the level of corporate governance impacts on the extent of the market's response to earnings announcements. Consistent with previous findings that (i) better corporate governance reduces information uncertainty and (ii) a reduction in information uncertainty increases investors' initial response to earnings announcements, we find that information uncertainty is the major channel through which corporate governance operates to increase the markets initial reaction to earnings announcements. Overall, this result suggests that better corporate governance increases the credibility of the information which translates into a greater acceptance of, and so a response to, the information by investors (Francis *et al.* 2007, Kanagaretnam *et al.* 2007, Zhang 2006).

Secondly, as a by-product of our research, we are the first study to show that investors exhibit a very different reaction to market uncertainty than they do to firm level information uncertainty. Consistent with previous studies on macro level uncertainty, we show that a high level of market uncertainty can assert an asymmetric effect on the investors' reaction to earnings news, reducing reaction to good news but exacerbating reaction to bad news. For firm level information uncertainty, however, our results show that a high level of information uncertainty diminishes investor reaction to both good and bad news. Further, this apparent reluctance to act on information continues in the post earnings period with high level of information uncertainty significantly reducing the PEAD. The implication being that a firm that has a high level of information uncertainty can be mispriced for an extended period of time which has obvious implications for the efficiency of the market.

The remainder of this study is organised as follows. Section 2 provides a summary of relevant prior studies and outlines the main research questions. Section 3 describes the sample and methodology used. Section 4 presents the results of our analysis and a battery of robustness tests while section 5 concludes.

2. Literature Review and Research Questions

2.1. Literature Review

Findings in the literature suggest that market conditions such as the prevailing level of market uncertainty and the overall sentiment of market participants exert a significant influence on how investors interpret and react to the influx of information (for example, Anderson *et al.* 2009, Bird and Yeung 2012, Epstein and Schneider 2008, Ozoguz 2009). The separation between the concepts of risk and *uncertainty* first discussed in the work of Knight (1921) and then Keynes (1937), laid down the foundation for a stream of research that looks at how uncertainty affects

asset prices outside the framework of traditional asset pricing models. For example, the theoretical work of Chen and Epstein (2002) shows that excess returns for a security are made of a risk premium and an ambiguity or uncertainty premium. The empirical results of Anderson et al. (2009), Connolly *et al.* (2005), Epstein and Schneider (2008), and Ozoguz (2009), among others, document the presence of a strong relation between uncertainty and return, confirming the existence of an uncertainty premium. Several empirical studies found that the asymmetric response to earnings surprise is primarily caused by uncertainty, whether economy-wide or firm-specific (Bird and Yeung 2012, Choi 2014, Jiang *et al.* 2005, Williams 2015, Zhang 2006). Furthermore, it has been suggested that uncertainty is a major contributor to the persistence of the PEAD (Bird *et al.* 2014, Caskey 2009, Francis *et al.* 2007, Gerard 2012).

It has been found that the *sentiment* of market participants also plays an important role in determining the direction and extent of their reaction to new information (De Long *et al.* 1990). For instance, Mian and Sankaraguruswamy (2012) find that markets are more responsive to good news released during periods of high sentiment as well as bad news released during periods of low sentiment. Moreover, Chung *et al.* (2012) find that market sentiment helps predict the returns on all portfolios during an economic expansion state when investors' optimism increases. Likewise, Baker and Wurgler (2006) report that market sentiment at the beginning of the period impact the expected returns at the end of it for a large subset of US stocks. Additionally, the findings of Baker and Wurgler (2007), Conrad *et al.* (2002), Lemmon and Portniaguina (2006), and Zouaoui *et al.* (2011), among others, suggest a significant role for market sentiment in predicting stock returns and explaining some market anomalies such as pricing bubbles. Bird and Yeung (2012) find that investor sentiment interreacts with market uncertainty in influencing how investors respond to earnings announcements to the extent they can override the signal with investors often reacting negatively to good news released at a time of high market uncertainty and low market sentiment. Bird *et al.* (2014) also found that investor sentiment and market uncertainty combine to impact on any market response to the information in the post-announcement period.

An important factor that can influence investors' reaction to new information, but which has received limited attention in the literature, is *corporate governance*. The strength of the firm's corporate governance framework influences the firm's information environment through several channels such as improving the quality as well as the quantity and frequency of its disclosures. In a recent study, Beekes *et al.* (2016) study a sample of more than 5,000 firms from 23 countries in the period between 2003 and 2008 and find that better governed firms made a greater number of disclosures to the market. Their results also show that better governed firms tended to release documents to the market in a timelier fashion, especially when these documents related to bad news. The results of Beekes *et al.* (2016) are similar to those reported in Beekes and Brown (2006) in the Australian market where they find that better governed firms make

more informative disclosures which in turn improves the accuracy of analysts' forecasts. Beekes and Brown (2006) also report that better governance is associated with timelier price discovery.

With regards to governance's effect on information quality, Byard *et al.* (2006) report the presence of a strong positive association between the quality of analysts' forecast about a firm's upcoming earnings and the quality of its corporate governance practices. They also report that corporate governance's strength affects the quality of mandatory and voluntary disclosures made by a firm, confirming the fact that better quality disclosures may reduce information uncertainty and improve analysts' ability to predict the firm's future performance. Similarly, Cai *et al.* (2006) report that governance characteristics such as the number of founding family members on the board and the number of female directors influence the level of information uncertainty in the market. Specifically, the more founding family members and the less female directors the board has the greater the information uncertainty. Hass *et al.* (2014) report similar results using a sample of Chinese listed firms in which better governed firms were found to have more informative earnings forecasts as measured by the accuracy of analysts' forecasts and price timeliness.

Furthermore, in a large sample of European firms, Bonetti *et al.* (2016) find that firms with strong board-level governance tend to have a significantly higher financial reporting quality and more informative earnings announcements compared to firms with weak board-level governance. Dargenidou *et al.* (2007) also document that firms with better governance are more likely to accurately incorporate bad news in reported and forecasted earnings thus improving the reliability of earnings announcements. On the whole, while a number of studies have focused on examining the relationship between corporate governance quality and the initial response to earnings announcements, there appears to have been no prior attempt at studying the relationship between corporate governance and the well-documented drift during the post announcement period.

Finally, this study also relates to the literature that takes into account of the joint impact of several sources of uncertainty. Much of the research in this area tackles the problem from a firm's production and/or investment perspective, examining how macro economic uncertainty arising from policy uncertainty (Rodrik 1991, Kang *et al.* 2014) or political uncertainty (Dixit and Pindyck 1994, McDonald and Seigel 1986) lead to uncertainty in the firm's utilisation of resources or reduce firm investment. Indeed macro economic uncertainty can induce firm level uncertainty, Chen *et al.* (2018) shows that political uncertainty can diminish a firm's information flow and quality of information (Chen *et al.* 2018). Similar to these studies, this paper also examines the impact of several sources of uncertainty, market wide and firm specific information uncertainty, however our interest lies in investors' reaction in the presence of uncertainty and ultimately the asset pricing implication of the these uncertainties.

2.2. Research Questions

This study first addresses two related questions:

1. *Is the market's immediate response to a firm's earnings announcements affected by its corporate governance characteristics?*
2. *Is the market's response during the post-announcement period affected by its corporate governance characteristics?*

In undertaking this analysis, we control for the level and/or movement in both market uncertainty and investor sentiment which the literature suggests are factors that exert a significant influence on how investors interpret and react to the flow of information (for example, Anderson *et al.* 2009, Baker and Wurgler 2007, Conrad *et al.* 2002, Epstein and Schneider 2008, Lemmon and Portniaguina 2006, Ozoguz 2009, Wurgler 2007). Furthermore, prior evidence in the literature suggests that stronger governance mechanisms are likely to enhance investors' immediate reaction to information signals through reducing firm-specific uncertainty and improving the perception of the quality of the firm's announcements (Cai *et al.* 2006, Hass *et al.* 2014, Kanagaretnam *et al.* 2007).

We then address a third question that relates to the channel through which a firm's corporate governance environment might influence the market's immediate and subsequent response to earnings announcements:

3. *Is the influence of corporate governance on the market's response to earnings announcements attributable to a significant extent to the favourable impact that it has on improving a firm's earnings quality?*
4. *What is the relative impact of corporate governance relative to market uncertainty and investor sentiment in explaining the extent of the initial and subsequent market response to earnings announcements?*

Francis *et al.* (2007) and Zhang (2006), among others, associate any delayed response to an earnings announcement with the perceived quality of a firm's information signal. Francis *et al.* (2007) find that announcements by firms with higher information uncertainty (IU) tend to experience a more muted initial market reaction. Zhang (2006) finds evidence that greater IU is associated with a greater price drift. Based on this evidence as well as the earlier discussion regarding the role of good corporate governance in reducing the effect of IU, firms with stronger governance are expected to have a greater initial reaction to earnings surprises and as a result a potentially smaller or an insignificant drift during the post-announcement period.

We examine investors' reaction under different market conditions where we consider the interplay between corporate governance, market uncertainty, and investor sentiment. Bird and Yeung (2012) show that strong market sentiment can mitigate the negative impact of market level uncertainty in investors' response to unexpected earnings news. In this study with the introduction of corporate governance, we can gauge the relative impact of each of these three components of the information environment in terms of their influence on how investors react to information signals.

5. Do the two types of uncertainty (market uncertainty and firm-specific information uncertainty) analysed in our study impact on the market response to information signals in a similar way?

In this study we follow in the footsteps of prior studies and include market uncertainty as part of the environment that influences the market response to information. We also include firm-level information uncertainty as one channel through which corporate governance influences the market response. This affords us the opportunity to compare the impact that each of the sources of uncertainty has on the pricing process at the time of, and subsequent to, the release of earnings news.

3. Data and Methodology

3.1. Sample Description

The sample of our study covers the quarterly announcements made by US public firms between January 2006 and December 2016¹. We source our accounting and market data from the CRSP/COMPUSTAT database for all firms that are part of the S&P 1500 Index². We extract corporate governance for the same sample from the ISS (formerly RiskMetrics) database and we construct our own corporate governance index following the approach outlined in the methodology section.

To calculate our measure of unexpected earnings we base our expectations on analysts' earnings forecasts obtained from I/B/E/S with the requirement that at least two analyst forecasts are available for a data point to be included in our final sample. Our final sample consists of all quarterly observations with sufficient governance and accounting/market data from the different databases. We winsorise all continuous variables at one percent and 99 percent. This results in us having 21,692 observations in our final sample, consisting of 14,672 positive surprises and 7,020 negative surprises³.

3.2. Variable Construction

3.2.1. Uncertainty and Sentiment Measures

Finding an accurate and a reflective measure of *uncertainty* has been a challenging task for many researchers in the field (Connolly *et al.* 2005). We follow Connolly *et al.* (2005), Williams (2015) and others in using the implied volatility from the options market, namely the market volatility index (VIX), to measure market uncertainty. An alternative proxy for uncertainty used in the literature has been disagreement among experts, such as a measure of the dispersion of analysts' economic forecasts (Anderson *et al.* 2009). We find strong support in the literature for using VIX as a measure of market uncertainty, and it has the advantage of being forward looking and calculated on a continuing basis. Bloom (2009) shows that volatility in the stock market as measured by VIX is highly correlated with periods of high economy-wide uncertainty. Furthermore, David and Veronesi (2002) develop an option pricing model that uses economic state uncertainty which identified a positive association between implied volatility in options and investors' uncertainty about fundamentals. Drechsler (2013) also shows that the large variance premium in options' prices can be explained by an equilibrium model that incorporates time varying Knightian uncertainty. Drechsler claims that the variance premium is the result of using options to hedge uncertainty. His results further demonstrate that changes in the levels of uncertainty cause fluctuations in the variance premium (see also Connolly *et al.* 2005).

We use the cumulative daily returns of a major market index (S&P 1500) over the five-days prior to the announcement to capture market *sentiment* at the time of the announcement (SMI) and thus avoid the day of the week effect (Brown and Cliff 2004). We also capture the change in market sentiment over the post announcement period (T+2 to T+60) by summing daily returns over the period. Various studies in the literature employ the sentiment index introduced in Baker and Wurgler (2006) to measure market sentiment, however the index is only available on a monthly basis which reduces its usefulness for our purposes as earnings announcements can be released at any time during a month. We use the Baker and Wurgler index in a later section to test the sensitivity of our results to the choice of the sentiment measure.

3.2.2. Standardised Unexpected Earnings (SUE)

Different measures of unexpected earnings (UE) which are based on either historical earnings or analysts' forecasts have been used in the literature. Since analysts' forecasts are a better reflection of market participants' expectations of a firm's earnings than historical earnings (see Livnat and Mendenhall 2006), we follow Liu *et al.* (2003), Livnat and Mendenhall (2006) and others by estimating SUE using analysts' forecasts. We calculate our SUE measure as:

$$SUE_{i,t} = \frac{E_{i,t} - \overline{E}_{i,t}}{P_{i,t}}$$

where $E_{i,t}$ is actual quarterly earnings per share for firm i in quarter t , $\overline{E}_{i,t}$ is the most recent consensus analysts' forecast available prior to the announcement of the quarterly earnings per share for firm i in quarter t and $P_{i,t}$ is the price for firm i at the end of the quarter. Following Mendenhall (2004) we only include observations when there are at least two forecasts available⁴.

3.2.3. Corporate Governance (GOVI) Measure

In line with many previous studies we construct a firm-level additive index of governance (GOVI) using the commonly-used measures of governance listed in *Appendix II* (for example, Aggarwal *et al.* 2010, Anderson and Gupta 2009, Brown *et al.* 2011, Brown and Caylor 2006). These 29 measures represent the various governance indicators available from the ISS database and capture well the different aspects of the firm's governance framework including its board and ownership characteristics, compensation structure, and control or anti-takeover provisions. Following Aggarwal *et al.* (2010) and Brown and Caylor (2006), we use the most recent governance thresholds provided by the Institutional Shareholder Services (ISS) Governance QuickScore 3.0 to construct our index. A firm gains one point for each of its governance attributes that meets the threshold suggested by ISS's guideline, or 0 otherwise⁵. The final value of our index is the total number of points accumulated by a firm divided by the total number of attributes, expressed as a percentage. When an attribute is missing for a particular firm, the score is based upon the remaining attributes with firms being deleted from the sample if more than one-third of the attributes are missing⁶.

3.2.4. Information Uncertainty (IU) Measure

We create proxies for information uncertainty in order to address our third question as to whether that it is this channel through which corporate governance works when influencing the market reaction to new information. The three proxies chosen on the basis that they are widely cited in the literature are: return volatility, volume traded, and earnings forecast dispersion (see Table I for more information). We create a dummy variable, IFUH, for each of these proxies that takes on a value of 1 if the value of the IU measure for the announcement year is above the median value for all other observations, or 0 otherwise. We construct the different IU measures so that higher values indicate higher IU.

Table I: Measures of Information Uncertainty (IU) ⁷

Measure	Definition	Expected Relation
Return Volatility (VOLT)	The yearly volatility in daily returns (Van Ness <i>et al.</i> 2001)	High IU (+)
Volume Traded (VOLM)	The total number of shares traded during the year divided by the number of outstanding shares (Draper and Paudyal, 2008)	Low IU (-)
Forecast Dispersion (FCDP)	The standard deviation of the most recent analyst earnings forecasts for the fiscal year divided by the consensus (median) forecast (Krishnaswami and Subramaniam, 1999)	High IU (+)

3.3. Main Models

We begin our analysis by examining the nature and significance of the initial reaction to earnings announcements using *Model 1a*. We also run *Model 1b* to test whether there is a post-earnings announcement drift in our sample. Following Conrad et al. (2002), Choi (2014), Williams (2015) and others, we specify our models as follows:

$$CAR(0,1)_{i,t} = \beta_0 + \beta_1 NUE_{i,t} + \beta_2 PUE_{i,t} + \text{Control Variables (SIZE}_{i,t}/BTMV_{i,t}/RLAG_{i,t}/FORC_{i,t}) + \text{Year dummies} + \text{Industry Dummies} + \varepsilon_i \quad (1a)$$

$$CAR(2,60)_{i,t} = \beta_0 + \beta_1 NUE_{i,t} + \beta_2 PUE_{i,t} + \text{Control Variables (SIZE}_{i,t}/BTMV_{i,t}/RLAG_{i,t}/FORC_{i,t}) + \text{Year dummies} + \text{Industry Dummies} + \varepsilon_i \quad (1b)$$

where $NUE_{i,t}$ ($PUE_{i,t}$) is the negative (positive) UE measure which takes the value of SUE when it is negative (positive) or 0 otherwise. $CAR_{i,t}$ is the cumulative abnormal return calculated for the day of the announcement (T+0) and the following day (T+1) for *Model 1a*, or the cumulative abnormal return calculated for the post-announcement period (T+2 to T+60) for *Model 1b*⁸. We calculate the abnormal return by subtracting the expected return from the actual return. The expected return is calculated using the market model approach as discussed in MacKinlay (1997) and Kothari and Warner (2007)⁹. The parameters of the market model (stated below) are calculated using the data from the 60 days preceding the announcement date (excluding the event window):

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t}$$

where $R_{i,t}$ and $R_{m,t}$ are the returns during period t for security i and the market index (that is, S&P 1500), respectively.

We have chosen to include four control variables that are known to influence our dependent variable, and which were found to be significant in prior studies¹⁰. The four variables are: size, book-to-market value, reporting lag, and number of forecasts. All variables are defined in more detail in Appendix I. The coefficients β_1 , and β_2 in Model 1a will inform us as to the strength of the market reaction to negative and positive earnings surprise, respectively. The same coefficients β_1 , and β_2 in Model 1b will indicate the existence of a PEAD.

3.3.1. Governance, Uncertainty, Sentiment and Earnings Announcements

For the announcement period, we define announcements with positive sentiment as those where the cumulative daily return of the market index (S&P 1500) for the preceding five-days is positive. Furthermore, we define announcements with high uncertainty as those where the value of VIX one day prior to the announcement is above the median for all the observations. In order to examine the relationship between uncertainty, sentiment, corporate governance, and unexpected earnings at the time of the announcement we run the following regression model:

$$\begin{aligned}
CAR(0,1)_{i,t} = & \beta_0 + \beta_1 NUE_{i,t} + \beta_2 PUE_{i,t} + \beta_3 GOVH_{i,t} + \beta_4 SMIP_{i,t} + \beta_5 VIXH_{i,t} \\
& + \beta_6 GOVH_{i,t} \times NUE_{i,t} + \beta_7 GOVH_{i,t} \times PUE_{i,t} + \beta_8 SMIP_{i,t} \times NUE_{i,t} + \beta_9 SMIP_{i,t} \times PUE_{i,t} \\
& + \beta_{10} VIXH_{i,t} \times NUE_{i,t} + \beta_{11} VIXH_{i,t} \times PUE_{i,t} + \text{Control Variables (SIZE}_{i,t}/\text{BTMV}_{i,t}/\text{RLAG}_{i,t}/ \\
& \text{FORC}_{i,t}) + \text{Year dummies} + \text{Industry Dummies} + \varepsilon_i
\end{aligned} \tag{2}$$

where CAR , PUE , NUE and the control variables were defined earlier. $GOVH_{i,t}$ is a dummy variable which takes the value 1 if the governance index value for the announcement year is above the median value for all other observations or 0 otherwise, while $SMIP_{i,t}$ is a dummy variable which takes the value 1 if the cumulative return on S&P 1500 (sentiment measure) five-days prior to the announcement is positive or 0 otherwise. $VIXH_{i,t}$ is a dummy variable which takes the value 1 if the VIX (uncertainty measure) value one day prior to the announcement is above the median value for all VIX observations or 0 otherwise. The answer to our first research question is to be found in both the sign and the significance of β_6 and β_7 as they represent the difference in the initial reaction to both NUE and PUE for better governed firms as compared to that of the less well governed firms.

3.3.2 Governance and the Post-Earnings Announcement Drift

With regards to the post-announcement period and the PEAD, we estimate the following model for the full sample:

$$\begin{aligned}
CAR(2,60)_{i,t} = & \beta_0 + \beta_1 NUE_{i,t} + \beta_2 PUE_{i,t} + \beta_3 GOVH_{i,t} + \beta_4 PSMIP_{i,t} + \beta_5 \Delta VIXH_{i,t} \\
& + \beta_6 GOVH_{i,t} \times NUE_{i,t} + \beta_7 GOVH_{i,t} \times PUE_{i,t} + \beta_8 PSMIP_{i,t} \times NUE_{i,t} + \beta_9 PSMIP_{i,t} \times PUE_{i,t} \\
& + \beta_{10} \Delta VIXH_{i,t} \times NUE_{i,t} + \beta_{11} \Delta VIXH_{i,t} \times PUE_{i,t} + \text{Control Variables (SIZE}_{i,t}/\text{BTMV}_{i,t}/\text{RLAG}_{i,t}/ \\
& \text{FORC}_{i,t}) + \text{Year dummies} + \text{Industry Dummies} + \varepsilon_i
\end{aligned} \tag{3}$$

where CAR , PUE , NUE , $GOVH$ and the control variables were defined earlier. $PSMIP_{i,t}$ is a dummy variable which takes the value 1 if the sum of the daily returns on the market index (sentiment measure) over the post-announcement period is positive or 0 otherwise, while $\Delta VIXH_{i,t}$ is a dummy variable that measures change in VIX (uncertainty measure) over the studied period and takes the value 1 if the value of VIX increases over post announcement period (T+2 to T+60) or 0 otherwise. The sign and significance of β_6 and β_7 provide the answer to our second research question as they represent the differing impact of earnings announcement for better governed firms as compared to less well governed firms.

3.3.3. Governance, the Firm's Information Environment and Earnings Announcements

In order to answer our third question, we run a regression based on the following equations using a structural equation modelling (SEM) routine to test the relationship illustrated in Figure 1.

$$\begin{aligned}
CAR(0,1)_{i,t} = & \beta_0 + \beta_1 NUE_{i,t} + \beta_2 PUE_{i,t} + \beta_3 GOVH_{i,t} + \beta_4 IFUH_{i,t} + \beta_5 SMIP_{i,t} \\
& + \beta_6 VIXH_{i,t} + \beta_7 GOVH_{i,t} \times NUE_{i,t} + \beta_8 GOVH_{i,t} \times PUE_{i,t} + \beta_9 IFUH_{i,t} \times NUE_{i,t} \\
& + \beta_{10} IFUH_{i,t} \times PUE_{i,t} + \beta_{11} SMIP_{i,t} \times NUE_{i,t} + \beta_{12} SMIP_{i,t} \times PUE_{i,t} \\
& + \beta_{13} VIXH_{i,t} \times NUE_{i,t} + \beta_{14} VIXH_{i,t} \times PUE_{i,t} + \text{Control Variables } (SIZE_{i,t} / BTMV_{i,t} / RLAG_{i,t} / \\
& FORC_{i,t}) + \text{Year dummies} + \text{Industry Dummies} + \varepsilon_i
\end{aligned} \tag{4a}$$

$$IFUH_{i,t} = \mu_0 + \mu_1 GOVH_{i,t} + \varepsilon_i \tag{4b}$$

$$IFUH_{i,t} \times NUE_{i,t} = \alpha_0 + \alpha_1 GOVH_{i,t} + \varepsilon_i \tag{4c}$$

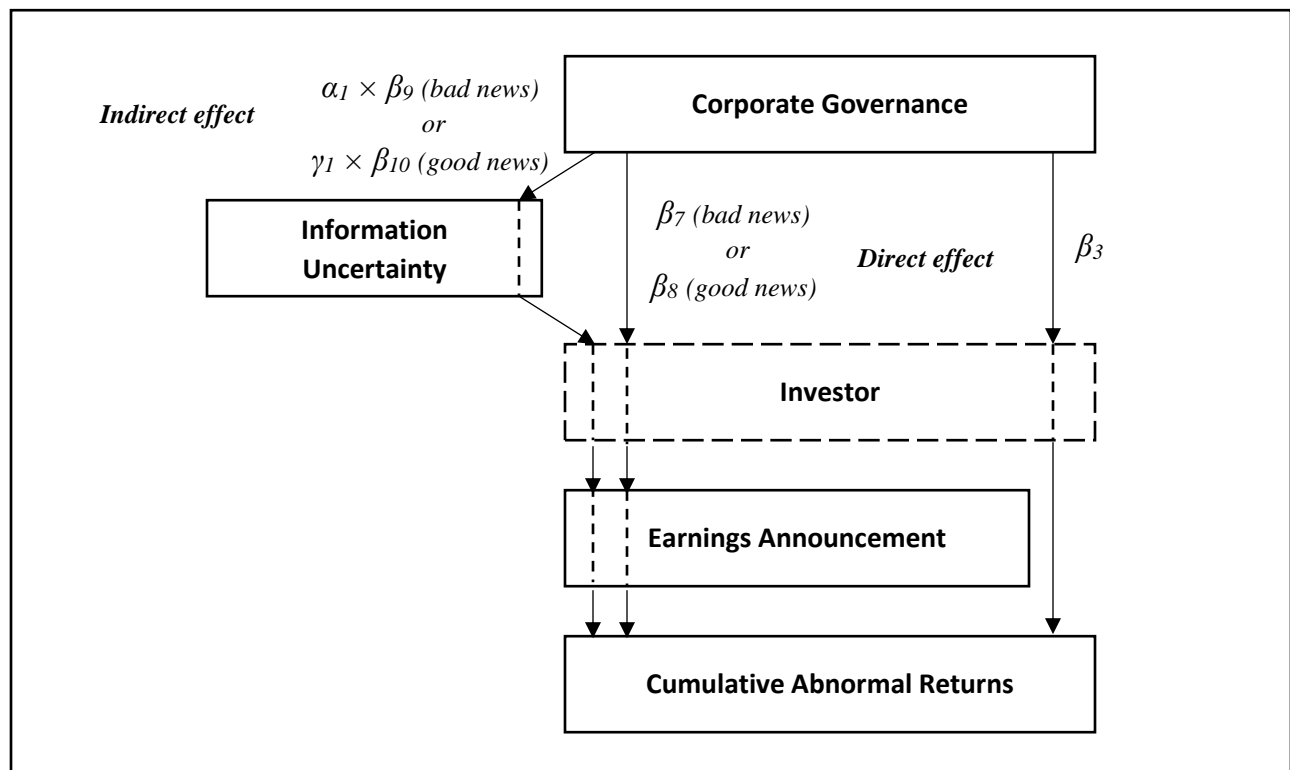
$$IFUH_{i,t} \times PUE_{i,t} = \gamma_0 + \gamma_1 GOVH_{i,t} + \varepsilon_i \tag{4d}$$

where all variables were explained earlier. We also re-run *models 4a-4d* with the cumulative abnormal returns for the post-announcement period (T+2 to T+60) as the dependent variable and the post-announcement measures of sentiment and uncertainty ($PSMIP$ and $\Delta VIXH$) instead of $SMIP$ and $VIXH$ (similar to model 3 but with the addition of the information uncertainty measures). The SEM routine assumes that governance influences the response to earnings announcements (the dependent variable) both directly (what we have seen so far) and indirectly through its impact on information uncertainty.

The indirect impact included in the SEM routine represents governance's influence on the market response to earnings announcements through its influence on information uncertainty¹¹. β_3 represents the direct effect of governance on share price while β_7 and β_8 represent the direct effect of governance through the reaction to the earnings surprise. The indirect effect of governance as illustrated in Figure 1 is represented by $\alpha_1 \times \beta_9$ and $\gamma_1 \times \beta_{10}$ for bad and good earnings surprises, respectively. If our proposition is valid, then we expect β_9 and β_{10} to be

significant with negative signs, indicating that firms with higher information uncertainty tend to have a more muted initial reaction to surprises in the earnings announcement. Based on our earlier observations, we also expect β_7 and β_8 to be significant with positive signs, indicating a higher initial reaction to announcements in better governed firms. Additionally, we expect the indirect effect of governance ($\alpha_1 \times \beta_9$ and $\gamma_1 \times \beta_{10}$) to be significant and to represent a significant portion of the total effect (direct and indirect), thereby confirming the role of governance in improving reaction to earnings announcements through reducing information uncertainty.

Figure 1: Illustration of the Structural Equation Modelling Routine
 Performed to Analyse the Relationship between Corporate Governance,
 Information Uncertainty and Reaction to Earnings Announcements



Note: The solid line arrows represent the direction of the relationship. The focus of this graph is to illustrate the relationship between corporate governance and changes in share price (that is, CAR), all other variables in model 4a are omitted from the illustration.

4. Results and Discussions

In this section of the paper we both present and discuss the findings stemming from our analysis. First, we present some sample statistics, then go on and report on the pattern of responses to earnings surprises in our sample. We then investigate the extent to which corporate governance contributes to the market response to earnings releases and close by examining the channel through which corporate governance impacts on this response.

4.1. Summary Statistics

Table 1 provides descriptive statistics for the final sample based on subsamples using the different governance, sentiment and uncertainty indicators. The results suggest that the magnitude of positive earnings surprises (PUE) is higher than that of negative surprises (NUE), regardless of the subsample used. Further, it suggests that firms with relatively weaker governance (GOVH=0) have significantly larger negative earnings surprises (NUE) than firms with stronger governance (GOVH=1). Also, we find that larger negative earnings surprise is experienced by firms reporting during periods of high market uncertainty and/or during periods when market uncertainty is increasing. We find that the magnitude of the positive earnings surprise (PUE) is unaffected by corporate governance, market uncertainty and market sentiment.

Table 1: Summary Statistics

Panel A: NUE and PUE Mean and Standard Deviation based on the Corporate Governance Index					
	High Governance Score (GOVH=1)		Low Governance Score (GOVH=0)		Difference (High - Low)
	Mean	Std. Dev.	Mean	Std. Dev.	Mean
NUE	-0.560	1.332	-0.757	1.283	0.197***
PUE	0.827	1.935	0.779	1.726	0.048
Panel B: NUE and PUE Mean and Standard Deviation based on the Different Uncertainty and Sentiment Groups					
	High Uncertainty (VIXH=1)		Low Uncertainty (VIXH=0)		Difference (High - Low)
	Mean	Std. Dev.	Mean	Std. Dev.	Mean
NUE	-0.678	1.439	-0.605	1.064	-0.073**
PUE	0.828	1.443	0.785	1.110	0.043
	Increasing Uncertainty (Δ VIXH=1)		Decreasing Uncertainty (Δ VIXH=0)		Difference (High - Low)
	Mean	Std. Dev.	Mean	Std. Dev.	Mean
NUE	-0.701	0.925	-0.580	1.405	-0.121***
PUE	0.807	1.622	0.808	1.907	-0.001
	Positive Sentiment (SMIP=1)		Negative Sentiment (SMIP=0)		Difference (Pos. - Neg.)
	Mean	Std. Dev.	Mean	Std. Dev.	Mean
NUE	-0.656	1.044	-0.624	1.406	-0.032
PUE	0.792	1.184	0.824	1.392	-0.032
	Positive Post Ann. Sent. (PSMIP=1)		Negative Post Ann. Sent. (PSMIP=0)		Difference (Pos. - Neg.)
	Mean	Std. Dev.	Mean	Std. Dev.	Mean
NUE	-0.653	1.062	-0.629	1.429	-0.248
PUE	0.814	1.172	0.800	1.392	0.014

Note: *Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

Panels A and B present the mean and median differences in our measures of positive (PUE) and negative (NUE) earnings announcements and control variables based on the corporate governance index and the different volatility and sentiments groups, respectively. $NUE_{i,t}$ ($PUE_{i,t}$) is the negative (positive) UE measure which takes the value of SUE when it is negative (positive) or 0 otherwise. $GOVH_{i,t}$ is a dummy variable which takes the value 1 if the governance index value for the announcement year is above the median value for all other observations or 0 otherwise. $SMIP_{i,t}$ is a dummy variable which takes the value 1 if the cumulative return on S&P 1500 (sentiment measure) five-days prior to the announcement is positive or 0 otherwise. $VIXH_{i,t}$ is a dummy variable which takes the value 1 if the VIX (uncertainty measure) value one day prior to the announcement is above the median value for all VIX observations or 0 otherwise. $PSMIP_{i,t}$ is a dummy variable which takes the value 1 if the sum of the daily returns on the market index (sentiment measure) over the post-announcement period is positive or 0 otherwise, while $\Delta VIXH_{i,t}$ is a dummy variable that measures change in VIX (uncertainty measure) over the studied period and takes the value 1 if the value of VIX increases over post announcement period (T+2 to T+60) or 0 otherwise. All variables are defined in Appendix I. The test for the equality of means uses Welch's t-test.

4.2 Earnings Surprises and the PEAD

Table 2 provides the results of applying models 1a and 1b to our sample in order to highlight the nature of the response of the market to an earnings surprise, both at the time of the announcement and during the post-announcement period. The coefficients of NUE and PUE are positive and significant in both regressions indicating an initial reaction to the announcement followed by a further reaction in the post-announcement period (that is, PEAD). In the first regression, the coefficient of PUE (+0.0045) is slightly larger than that of NUE (+0.0039) suggesting a stronger initial reaction by investors to each unit of positive surprise as compared to each unit of negative surprise. In the second regression, the sign and significance of the coefficients attached to NUE (+0.0047) and PUE (+0.0034) confirm the existence of a post-announcement drift for both positive and negative surprise. We can also see that the coefficient for negative surprises is now significantly higher than that for positive surprises, which suggests the smaller initial reaction to a to each unit of bad earnings news is followed by a larger PEAD.

Our findings for the control variables are somewhat as expected. The sign on size is negative and significant over each of the two periods indicating that smaller stocks outperform. In contrast, the sign on book to market is negative and significant indicating that the response for growth stocks is larger than that for value stocks. The positive sign of the variable measuring the number of forecasts (FORC) indicate a positive association with cumulative abnormal returns which suggests that such stocks are more heavily promoted at the time of the earnings release. Lastly, the variable for the length of time has the expected negative sign but it is insignificant.

Table 2: Multivariate Regressions of the Cumulative Abnormal Returns
for the Announcement and Post-Announcement periods on the Standardized Unexpected Earnings

	(1) CAR (0,1)	(2) CAR (2,60)
Intercept	0.0083** (1.990)	0.0019 (0.220)
NUE	0.0039*** (23.240)	0.0047*** (9.560)
PUE	0.0045*** (30.980)	0.0034*** (15.340)
SIZE	-0.0021*** (-5.160)	-0.0015* (-1.700)
BTMV	0.0048*** (4.790)	0.0075*** (3.520)
RLAG	-0.0000 (-0.120)	-0.0000 (-0.080)
FORC	0.0002*** (2.860)	0.0004*** (2.700)
Test of Difference	NUE < PUE**	NUE > PUE***
Number of Observations	21,692	21,692
Year/Industry Dummies	YES	YES

Note

*Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

Table 2 presents the results of running ordinary least squares regressions using models 1a and 1b. The dependent variable, $CAR_{i,t}$, is the cumulative abnormal return calculated for the period specified in the brackets. $NUE_{i,t}$ ($PUE_{i,t}$) is the negative (positive) UE measure which takes the value of SUE when it is negative (positive) or 0 otherwise. All variables are defined in *Appendix I*. The t-Statistics are reported in the parentheses. The standard errors are clustered across firm and time.

4.3. Governance, Uncertainty, Sentiment and Earnings Announcements

In Table 3 we report the findings relating to our first two research questions concerning the impact of corporate governance on the market response to earnings announcement both at the time of the announcement and during the post-announcement period.

Table 3: Multivariate Regressions of the Cumulative Abnormal Returns
for the Announcement and Post-Announcement Periods on the Standardized Unexpected Earnings
and Governance, Uncertainty and Sentiment Dummies

	(1) Model 2 CAR (0,1)	(2) Model 3 CAR (2,60)
Intercept	0.0086** (1.970)	-0.0007 (-0.080)
NUE	0.0049*** (12.060)	0.0036*** (4.70)
PUE	0.0035*** (9.230)	0.0056*** (6.370)
GOVH	0.0023** (2.250)	0.0004* (1.910)
SMIP	0.0000 (0.680)	
VIXH	0.0000 (0.700)	
PSMIP		0.0093*** (3.010)
ΔVIXH		-0.0004 (-0.150)
GOVH×NUE	0.0075*** (2.890)	0.0000 (0.710)
GOVH×PUE	0.0082*** (5.850)	0.0000 (0.830)
SMIP×NUE	-0.0024*** (-6.300)	
SMIP×PUE	0.0006** (2.470)	
VIXH×NUE	0.0005* (1.700)	
VIXH×PUE	-0.0003* (-1.910)	
PSMIP×NUE		-0.0026*** (-3.190)
PSMIP×PUE		0.0000 (0.030)
ΔVIXH×NUE		0.0039*** (4.090)
ΔVIXH×PUE		-0.0028*** (-3.800)
SIZE	-0.0021*** (-5.040)	-0.0012* (-1.810)
BTMV	0.0048*** (4.760)	0.0068*** (3.190)
RLAG	-0.0000 (-0.050)	-0.0000 (-0.050)
FORC	0.0002*** (2.620)	0.0005*** (2.970)
Number of Observations	21,692	21,692
Year/Industry Dummies	YES	YES

*Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level

Table 3 presents the results of running ordinary least squares regressions using Models 2 and 3. Refer to the text for full explanation of the models. The dependent variable, $CAR_{i,t}$, is the cumulative abnormal return calculated for the period specified in the brackets. $NUE_{i,t}$ ($PUE_{i,t}$) is the negative (positive) UE measure which takes the value of SUE when it is negative (positive) or 0 otherwise. $GOVH_{i,t}$ is a dummy variable which takes the value 1 if the governance index value for the announcement year is above the median value for all other observations or 0 otherwise. $SMIP_{i,t}$ is a dummy variable which takes the value 1 if the cumulative return on S&P 1500 (sentiment measure) five-days prior to the announcement is positive or 0 otherwise. $VIXH_{i,t}$ is a dummy variable which takes the value 1 if the VIX (uncertainty measure) value one day prior to the announcement is above the median value for all VIX observations or 0 otherwise. $PSMIP_{i,t}$ is a dummy variable which takes the value 1 if the sum of the daily returns on the market index (sentiment measure) over the post-announcement period is positive or 0 otherwise, while $\Delta VIXH_{i,t}$ is a dummy variable that measures change in VIX (uncertainty measure) over the studied period and takes the value 1 if the value of VIX increases over the post-announcement period (T+2 to T+60) or 0 otherwise. All variables are defined in Appendix I. The t-Statistics are reported in parentheses. The standard errors are clustered across firm and time.

4.3.1. At the Time of the Announcement

We apply model 2 to our sample to address the initial impact of corporate governance and report our findings in the first column of Table 3. The critical coefficients on which to focus are β_6 and β_7 which measure the difference between the impact of a quantum of unexpected earnings news on the valuation of a firm with high corporate governance as compared with one with low corporate governance. For both negative earnings surprises and positive earnings surprises, these coefficients are positive and significant (0.0075*** for NUE and 0.0082*** for PUE) indicating that an earnings surprise has a much larger impact on the valuation of a firm that enjoys a high level of corporate governance. From this we can conclude that the level of corporate governance influences how investors react to earnings information flowing from a firm.

The fact that stronger corporate governance results in a greater reaction suggests that the investors might give more credibility to information being released by firms with high levels of corporate governance which is a proposition that we will consider in more detail in the next section. It is also worth noting that the coefficient measuring the direct relationship between corporate governance and firm valuation (β_3) is also significant and positive, confirming the findings of previous studies that firms with strong corporate governance are more highly valued by the market.

Our findings for both uncertainty and sentiment are consistent with the findings of other papers with the market response to good earnings news being greatest when uncertainty is low and sentiment is high, while the response to bad earnings news is greatest when uncertainty is

high and sentiment is low (Bird and Yeung 2012, Bird *et al.* 2014). We find that greater uncertainty causes investors to take a more pessimistic view when confronted with new information causing them to react more to bad news and less to good news. Investor sentiment has the opposite effect of causing investors to take a more optimistic stance when analysing new information resulting in them reacting more to good news and less to bad news. Hence it is obvious that governance works in a different way to both uncertainty and sentiment in affecting investor response to new information as a higher level of governance cause investors to respond more to both good and bad earnings news. We would propose this difference reflects that corporate governance works through a different path to both uncertainty and sentiment in terms of influencing how investors respond to information signals.

Both uncertainty and sentiment work more on the state of mind of the investors and impact on the expectations that investors' form based on their analysis of the information. In contrast, governance impacts on the credibility that investors attribute to the information causing them to be less conservative when adjusting their expectations in response to new information. Another observation that we would make is that corporate governance has a much larger impact on how investors initially react to earnings announcements than does either uncertainty or sentiment. We see that for each quantum of good and bad news the share price of firms with above-median governance increases by about 0.8 percent more than does the share price of firms with below-median governance. In contrast, both uncertainty and sentiment have a much smaller impact on investor response, which is very minimal in the case of sentiment. In summary, corporate governance has been shown to have a greater influence on the initial reaction to earnings announcements than does both uncertainty and sentiment, and to work through a different channel.

4.3.2. During the Post-Announcement Period

We apply Model 3 to our sample to address the impact of corporate governance over the post-announcement period and report our findings in the second column of Table 3. Undoubtedly, our major finding is that the extent of a firm's corporate governance does not play a role in explaining the drift that typically occurs during the post-announcement period (i.e. the PEAD). In contrast, the change in the level of uncertainty plays a major role in explaining the PEAD, several times the magnitude of what uncertainty contributed to price movement at the time of the announcement.

We also find that the prevailing sentiment over the post-announcement period also influences the magnitude of the PEAD but only in the instance of a reaction to a negative earnings surprise as sentiment is not found to influence the magnitude of the PEAD in the case of a positive earnings surprise. It is interesting to observe that this is in line with the influence of

sentiment on the initial reaction to the earnings news, which was much greater for bad news than it was for good news.

The question this raises is why does the level of governance play such an important role in explaining the initial market reaction to an earnings announcement but no role in explaining any drift in the post-announcement period? The answer we suggest lies in the proposition that corporate governance influences the share price response through the impact that it has on investors' perceived credibility of the information being provided. Hence the greater the credibility, the greater the initial response to the earnings announcement. The question then becomes what would cause investors to reassess their initial response to the earnings announcement? The answer that we would put forward is that any perceived change in the credibility of the information would require investors to go back and reassess their initial response to the announcement but supposedly this would require a non-trivial change in the firm's governance characteristics. Since corporate governance changes very little overtime, there is no reason to believe that it would play a role in explaining the PEAD. Our findings would suggest that the PEAD is at least partially driven by changes in some of the factors that influenced the initial response to the earnings release. We have seen that changes in uncertainty over the announcement period and the sentiment prevailing during this period are both important factors that cause investors to reassess their initial response to an earnings announcement and thus both impact on the magnitude and direction of the PEAD.

4.4. Information uncertainty (IU) as a Potential Explanation for the Role of Governance

We have proposed that an important reason for corporate governance influencing the market response to information is because of the impact it has on the credibility of the information being provided. The third research question relates to identifying the major channel through which corporate governance works to influence how investors react to earnings announcements? We have proposed that a major way by which governance works is through reducing information uncertainty and so contributing to the credibility of the information being provided. We investigate this in two steps: first establishing the link between corporate governance and information uncertainty and then investigating the extent to which the relationship between corporate governance and the market response to earnings announcements is explained by the information uncertainty channel.

4.4.1. Corporate Governance and Information Uncertainty

We rank our firms based on their corporate governance score and then divide the sample into quintiles giving us five sub-samples ranking from those with the lowest corporate governance to those with the highest level of corporate governance. In Table 4 we report the median value for each of our proxies for information uncertainty for each of the five sub-samples. Our findings clearly indicate a monotonic relationship with information uncertainty decreasing as we proceed

from the lowest governance quintile to the highest governance quintile. We see for each of the three proxies, there is a very significant difference between the median values for each proxy for the lowest and highest governance quintiles. The conclusion that we draw is that there is a link between the level of corporate governance practiced within a firm and the level of uncertainty associated with information flowing from the firm.

Table 4: Median Information Uncertainty (IU) Measures Values
Based on the Governance Index Scores

Quintile Based on the Governance Index	VOLT	VOLM	FCDP
Quintile 1 (<i>weakest governance</i>)	0.0215	-0.0006	0.0519
Quintile 2	0.0212	-0.0011	0.0476
Quintile 3	0.0201	-0.0014	0.0458
Quintile 4	0.0196	-0.0024	0.0417
Quintile 5 (<i>strongest governance</i>)	0.0188	-0.0061	0.0385
Q5 (strongest) versus Q1 (weakest)	Q5 < Q1***	Q5 < Q1***	Q5 < Q1***
Number of Observations	21,692	21,692	21,692

*Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

Table 4 presents the median values of the different proxies of IU (defined in *Table I*) for each quintile of corporate governance scores. The five quintiles are based on the scores of the governance index with the highest quintile (Quintile 5) having the observations with the highest governance scores (that is, strongest governance framework). The different IU proxies were constructed so that higher values indicate higher IU. All variables are defined in Appendix I.

4.4.2. Information Uncertainty and Earnings Response

The results are to be found in Table 5 from applying models 4a-4d using structural equation modelling (see Figure 1) to our sample. We only report the coefficient for the variables of interest, corporate governance (GOV) and information uncertainty (IFU) as those for the other variables remain unchanged to those reported in Table 3. The findings confirm our previous finding that when now using each of the three proxies for information uncertainty, corporate governance increases the impact that both bad and good earnings news has on corporate valuations during the announcement period (that is, the coefficients attached to both GOVH×NUE and GOVH×PUE in Columns 1 to 3 are all positive and significant). Also consistent with our previous finding, the impact of corporate governance on the markets response to earnings news quickly fades away and it is found to play no part in explaining the PEAD (that is, the coefficients attached to both GOVH×NUE and GOVH×PUE in columns 4 to 6 are

insignificant). We previously proposed that the heightened initial response reflected that the credibility of the earnings announcements increased with the level of corporate governance, but that the influence of corporate governance wanes after the announcement as this variable remains constant over the post-announcement period.

The coefficients reported for information uncertainty are negative and significant for all proxies during both the announcement period and the post-announcement period reflecting that high information uncertainty dampens the market response to both good and bad earnings news (that is, the coefficients attached to both $IFUH \times NUE$ and $IFUH \times PUE$ in Columns 1 to 6 are all negative and significant) not only during the announcement period but also during the post-announcement period. This is consistent with our previous interpretation that information uncertainty is always a drag on corporate valuations because it reduces investors' belief in the information and so the extent to which they are willing to build the full impact of the information into their expectations.

The findings have strong implication for asset pricing and the efficiency of the market and is at variance with those of Zhang (2006) who finds that information uncertainty decreased the investors' initial response to earnings news but increased the contribution made to the PEAD. His explanation being that somehow the information uncertainty is resolved in the mind of the investors during the post-announcement period and so the drift reflects their recognition of the mistake that they made when initially responding to the announcement. We would first question the evidence on which he based his claims as in measuring the impact that information uncertainty has on investor response, he failed to control for any of the variables that demonstrably impact on that response (e.g. market uncertainty, investor sentiment and others). The other comment that we would make is to question just why information uncertainty would be significantly resolved in the mind of investors in the intervening period to the next quarterly earnings announcement but then again be the cause of an underreaction to the next earnings announcement.

Table 5 also offers an interesting insight into how investors react to differing sources of uncertainty. Consistent with Williams (2015) and Bird and Yeung (2012), the presence of market uncertainty induces an asymmetric response to the initial earnings announcement that can be regarded as investors following a minmax utility maximisation in their reaction to uncertainty. The findings in table 5 also confirm that high sentiment also induces an asymmetric response but in the opposite direction to that of market uncertainty. Yet in the presence of information uncertainty at the firm level, investors appear to systematically underreact to news both at the time of announcement and over the PEAD period. The asymmetric response to market uncertainty is consistent with uncertainty aversion where investors taking a dimmer view of information. In contrast, information uncertainty causes investors to attach less credibility to information and so underreact to both good and bad news.

Table 5: Multivariate Regressions of Cumulative Abnormal Returns for the Announcement and Post-Announcement Periods on the Standardized Unexpected Earnings and Information Uncertainty (IU) Measure

IU measure (IFUH)	Announcement Period			Post-announcement Period		
	VOLT	VOLM	FCDP	VOLT	VOLM	FCDP
Dependent Variable	(1) CAR (0,1)	(2) CAR (0,1)	(3) CAR (0,1)	(4) CAR (2,60)	(5) CAR (2,60)	(6) CAR (2,60)
Direct Effect						
Model 4a						
NUE (β_1)	0.0039*** (21.790)	0.0037*** (23.230)	0.0036*** (20.260)	0.0033*** (9.600)	0.0035*** (10.390)	0.0035*** (9.230)
PUE (β_2)	0.0035*** (19.940)	0.0034*** (21.290)	0.0033*** (18.520)	0.0037*** (10.600)	0.0038*** (11.360)	0.0038*** (10.190)
GOVH (β_3)	0.0022** (2.090)	0.0023** (2.430)	0.0023* (1.770)	0.0009** (2.270)	0.0009*** (2.610)	0.0008** (2.200)
IFUH (β_4)	-0.0006*** (-2.610)	-0.0006* (-1.870)	-0.0019** (-2.050)	-0.0014* (-1.770)	-0.0015*** (-3.520)	-0.0026** (-2.340)
GOVH×NUE (β_7)	0.0017*** (7.470)	0.0018*** (6.570)	0.0019*** (5.240)	0.0000 (1.160)	0.0000 (1.370)	0.0000 (1.140)
GOVH×PUE (β_8)	0.0021*** (6.840)	0.0022*** (6.030)	0.0018*** (4.720)	0.0000 (1.130)	0.0000 (1.530)	0.0000 (1.270)
IFUH×NUE (β_9)	-0.0025*** (-13.940)	-0.0023*** (-11.210)	-0.0014*** (-6.750)	-0.0016*** (-3.810)	-0.0022*** (-5.150)	-0.0016*** (-3.650)
IFUH×PUE (β_{10})	-0.0022*** (-12.760)	-0.0020*** (-9.790)	-0.0012*** (-5.900)	-0.0018*** (-4.130)	-0.0024*** (-5.590)	-0.0017*** (-3.960)
Model 4b						
GOVH (μ_1)	-4.0000*** (2.540)	-3.6667*** (2.940)	-1.4211*** (2.880)	-0.8571*** (2.260)	-0.4667*** (2.150)	-0.3462*** (2.770)
Model 4c						
GOVH (α_1)	-1.2800*** (7.810)	-1.1739*** (7.920)	-1.8571*** (6.200)	0.0000 (0.940)	0.0000 (1.100)	0.0000 (1.670)

Model 4d

GOVH (γ_1)	-1.3636*** (6.200)	-1.7000*** (6.150)	-2.4167*** (4.970)	0.0000 (0.480)	0.0000 (0.620)	0.0000 (0.690)
Indirect Effect (GOVH through IFUH)						
Negative announcements (NUE) ($\alpha_1 \times \beta_9$)	0.0032*** (7.360)	0.0027*** (7.720)	0.0026*** (5.890)	0.0000 (0.720)	0.0000 (0.960)	0.0000 (1.660)
Positive announcements (PUE) ($\gamma_1 \times \beta_{10}$)	0.0030*** (6.730)	0.0034*** (6.040)	0.0029*** (4.800)	0.0000 (0.410)	0.0000 (0.560)	0.0000 (0.630)
Indirect proportion of total effect (%)						
Negative announcements (NUE) ($\alpha_1 \times \beta_9$) / [($\alpha_1 \times \beta_9$) + β_7]	65%	60%	58%	3%	4%	3%
Positive announcements (PUE) ($\gamma_1 \times \beta_{10}$) / [($\gamma_1 \times \beta_{10}$) + β_8]	59%	61%	62%	1%	2%	5%
Likelihood Ratio Test (Goodness of Fit)	2.05	1.89	1.66	1.98	1.93	2.03
Control/Sentiment/Uncertainty Variables	YES	YES	YES	YES	YES	YES
Year/Industry dummies	YES	YES	YES	YES	YES	YES
Number of Observations	21,692	21,692	21,692	21,692	21,692	21,692

Notes

The table present the results of several multivariate regressions (models 4a-4d) using the cumulative abnormal returns (CAR) as the dependent variable and the structural equation modelling routine described in *Figure 1*. For the sake of brevity, the table presents the results for the variables related to governance and information uncertainty only as they are the focus of this analysis. For the announcement period, $CAR_{i,t}$ is the cumulative abnormal return calculated for the day of the announcement (T+0) and the following day (T+1), while for post-announcement period the cumulative abnormal return is calculated for the post-announcement period (T+2 to T+60). $NUE_{i,t}$ ($PUE_{i,t}$) is the negative (positive) UE measure which takes the value of SUE when it is negative (positive) or 0 otherwise. $GOVH_{i,t}$ is a dummy variable which takes the value 1 if the governance index value for the announcement year is above the median value for all other observations or 0 otherwise. $IFUH_{i,t}$ takes the value 1 if the value of the IU measure (defined in *Table I*) for the announcement year is above the median value for all other observations or 0 otherwise. The IU measures are constructed so that higher values indicate higher IU. All variables are defined in *Appendix I*. The Likelihood Ratio Test (chi-square test value reported) compares the model's fit to the saturated model. The standard errors are clustered across firm and time. *Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level. The total effect is the sum of coefficients of the direct effect (e.g. β_7 or β_8) and the indirect effect (e.g. $\alpha_1 \times \beta_9$ or $\gamma_1 \times \beta_{10}$) for each type of announcement (bad or good).

The final important result reported in Table 5 relates to the indirect channel through which corporate governance reduces information uncertainty which in turn impacts on the response of investors at the time of, and subsequent to, the earnings release. We see that this indirect channel explains the majority of the association between corporate governance and the market reaction to the information signal over the announcement window which is consistent with the explanation that corporate governance increases the credibility of the information. However, over the post-announcement period, the indirect channel has no impact on the market response reflecting that it plays no role in explaining the PEAD. This finding is totally consistent with our previous finding that the level of corporate governance did not influence the PEAD as during this period there is no variation in corporate governance that would cause investors to reassess their initial reaction to the earnings release. Overall, our findings confirm that information uncertainty is an important indirect channel through which corporate governance influences the market response to information.

Finally, to comment on the other variables reported in Table 5, the coefficient on NUE and PUE are both positive and significant reflecting in this case a positive response both at the time of the announcement and over the post-announcement period (that is, PEAD does exist) in this case for companies with low corporate governance and information uncertainty releasing earnings news at a time of low market uncertainty and investor sentiment. The positive and significant coefficient attached to high corporate governance (GOVH) is consistent with corporate governance having an impact on corporate valuations independent of any reaction to earnings announcement. Similarly, the significant negative coefficient attached to high information uncertainty (IFUH) confirms that information uncertainty has a negative impact on corporate valuation, again independent of any impact that it might have on the market response to the release of earnings announcements. Lastly, the significant and negative coefficients attached to corporate governance in models 4b, 4c and 4d are all indicative of the impact that it has on reducing information uncertainty.

4.5. Robustness Tests

In order to test the robustness of our results to our choice of the different measures, we repeat our main analysis using alternative measures as follows:

Governance Quality

We use the first principal component score (explains 73 percent of the variation) from a principal component analysis that includes the various governance attributes and related thresholds outlined in Appendix II to provide us with an alternative set of weights to calculate our governance score¹². This allows us to produce the governance score by allocating different

weights to the various governance attributes rather than using similar weights for all attributes as done so far. We define our alternative governance measure as the first principal component (and its related loadings) of the correlation matrix of the 29 governance attributes discussed earlier. The coefficients are rescaled so that the index has unit variance.

Uncertainty

Instead of VIX which was used so far in our main regressions, we use the detrended stock turnover level used in Connolly *et al.* (2005) as an alternative measure of uncertainty. Prior research supports the use of stock turnover to measure uncertainty as it reflects dispersion in beliefs among market participants and/or the changes in the investment opportunity set, both of which are linked to uncertainty (Connolly *et al.* 2005). We measure turnover as the average daily scaled turnover (shares traded divided by shares outstanding) of the firms with the largest market capitalization (Top 10 percent). As highlighted in Connolly *et al.* (2005), such approach helps approximate the overall market conditions while avoiding any noise from uninformative trading of small stocks. Next, we de-trend our turnover measure using a five-day moving average, which allows us to reduce noise and avoid day of the week effect (Connolly *et al.* 2005)¹³.

Sentiment

We use the six factors sentiment index introduced in Baker and Wurgler (2006) as an alternative measure to index returns which we have used so far to measure market sentiment¹⁴. Baker and Wurgler build a monthly sentiment index based on the first principal component of six different sentiment proxies¹⁵. Table 6 shows the results derived by applying the same analysis as that used when preparing Table 3 but using these alternative measures for each of governance, uncertainty and sentiment¹⁶. We find that our main findings generally hold even after using an alternative set of measures for the major variables. Namely, we find that governance significantly increases investors' reactions to earnings announcements and that it plays a more important role than uncertainty or sentiment during the announcement period. We also find that this role becomes insignificant during the post-announcement period in favour of the prevailing uncertainty and sentiment conditions.

Table 6: Robustness Tests Testing the Sensitivity of our Results
to Alternatives Measures of Governance, Uncertainty and Sentiment

	(1) Model 2 CAR (0,1)	(2) Model 3 CAR (2,60)
Intercept	0.0074* (1.660)	0.0006 (0.070)
NUE	0.0026*** (10.530)	0.0017*** (3.780)
PUE	0.0043*** (16.580)	0.0046*** (8.990)
GOVHA	0.0016 (1.430)	0.0003 (1.480)
SMIPA	0.0012 (0.740)	
VIXHA	0.0009 (0.860)	
PSMIPA		0.0057 (1.640)
Δ VIXHA		-0.0071*** (-2.770)
GOVHA×NUE	0.0066*** (5.520)	0.0001 (0.790)
GOVHA×PUE	0.0057*** (4.160)	0.0001 (1.070)
SMIPA×NUE	-0.0012*** (-3.040)	
SMIPA×PUE	0.0006* (1.910)	
VIXHA×NUE	0.0012*** (3.480)	
VIXHA×PUE	-0.0011*** (-3.800)	
PSMIPA×NUE		-0.0010** (-1.970)
PSMIPA×PUE		0.0012* (1.870)
Δ VIXHA×NUE		0.0045*** (4.540)
Δ VIXHA×PUE		-0.0021*** (-3.470)
SIZE	-0.0021*** (-5.030)	-0.0014* (-1.920)
BTMV	0.0049*** (4.830)	0.0072*** (3.350)
RLAG	-0.0000 (-0.160)	-0.0000 (-0.120)
FORC	0.0002*** (2.630)	0.0005*** (2.990)
Number of Observations	21,692	21,692
Year/Industry Dummies	Yes	Yes

*Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

Table 6 presents the results of running ordinary least squares regressions using models 2 and 3 and the alternative measures. Refer to the text for full explanation of the models. The dependent variable, $CAR_{i,t}$, is the cumulative abnormal return calculated for the period specified in the brackets. $NUE_{i,t}$ ($PUE_{i,t}$) is the negative (positive) UE measure which takes the value of SUE when it is negative (positive) or 0 otherwise. $GOVHA_{i,t}$ is a dummy variable which takes the value 1 if the first principal component score for the announcement year is above the median value for all other observations or 0 otherwise. $SMIPA_{i,t}$ is a dummy variable which takes the value 1 if the value of the six factors Sentiment Index for the particular month is above the median value for all observations or 0 otherwise. $VIXHA_{i,t}$ is a dummy variable which takes the value 1 if the detrended stock turnover level (uncertainty measure) value one day prior to the announcement is above the median value for all observations or 0 otherwise. $PSMIPA_{i,t}$ is a dummy variable which takes the value 1 if the value of the six factors Sentiment Index increases over the announcement period (Month 1 to Month 3), while $\Delta VIXHA_{i,t}$ is a dummy variable that measures change in detrended stock turnover level over the studied period and takes the value 1 if the value increases over the post-announcement period (T+2 to T+60) or 0 otherwise. All variables are defined in *Appendix I*. The standard errors are clustered across firm and time.

5. Conclusions

This study examines the role of the firm's corporate governance characteristics in influencing market participants' initial reaction to earnings announcement while controlling for both market sentiment and uncertainty. Our findings confirm the role of governance in significantly strengthening the initial reaction to earnings announcement with the response to a quantum of both good and bad earnings news being greater for firms with a high level of corporate governance. Our results are consistent with investors having more confidence in the quality of earnings announcements made by better governed firms which leads them to attribute more credibility to any surprise element in these announcements. This finding is supported by prior findings in the literature regarding the role of corporate governance in improving the quality attached to the firm's announcements (Beekes *et al.* 2016, Beekes and Brown 2006, Cai *et al.* 2006, Hass *et al.* 2014).

The study also investigates the role of governance during the post earnings announcement period. Interestingly, our analysis highlights that corporate governance does not play a role in explaining the PEAD which is a phenomenon that is largely explained by changes in market uncertainty and prevailing market sentiment. A likely explanation for this finding being that investors only turn to reassessing their initial reaction to an earnings announcement when there is a change in the environment that prevailed at the time of the announcement. Corporate governance changes very little over the post-announcement period which contributes to our finding that corporate governance is not a stimulus for investors to reassess their initial reaction

to the announcement. In contrast, both market uncertainty and sentiment do change over relatively small periods of time and so it is not surprising to find that they do contribute to the PEAD.

Bernard and Thomas (1989, 1990), Francis *et al.* (2007) and Zhang (2006) all attribute the delayed response to earnings announcements to uncertainty about the quality of the information signals. We undertake further analysis which confirms that the major contributing factor to the observed relationship between better governance and a greater market response to earnings announcements is the role of governance in reducing information uncertainty and improving the firm's information environment (Byard *et al.* 2006, Hass *et al.* 2014). This suggests that there are two channels through which governance influences investors' reaction to information signals, one is direct through how investors perceive the firm's governance quality and its link to the firm's performance and valuation, whereas the other one is indirect through how governance influences investors' perception of the quality of the information signal.

Finally, we found that market uncertainty and information uncertainty influence the decision-making process of investors in different ways. Market uncertainty causes them to take a more pessimistic stance when evaluating information which causes them to downplay good news but enhance their response to bad news. In contrast, information uncertainty causes them to attach less credibility to all news which causes investors to moderate their response to both good and bad news.

Overall, this study contributes to the stream of research focusing on studying and understanding the response of market participants to different types of news and events under different market and firm-specific conditions. The study also adds to previous attempts to explain the persistence of the PEAD and brings into question whether it is necessarily a process for moving prices back to a more efficient level. The insights from this study may help inform various trading and pricing decisions by investors in the market and contribute to better understanding of investors' behaviour around earnings announcements. Since the focus of this paper is on the overall governance quality of a firm, future research can focus on finding the specific governance attributes that contribute most to the observed relationship. Future research can also examine the impact of using governance quality as an indicator to guide trading strategies targeted towards extracting value from the PEAD.

References

- Aggarwal, R., Erel, I., Stulz, R., & Williamson, R. (2010). Differences in Governance Practices between U.S. and Foreign Firms: Measurement, Causes, and Consequences. *The Review of Financial Studies*, 23(3), 3131-3169.
- Anderson, A., & Gupta, P. P. (2009). A cross-country comparison of corporate governance and firm performance: Do financial structure and the legal system matter? *Journal of Contemporary Accounting & Economics*, 5(2), 61-79.
- Anderson, E. W., Ghysels, E., & Juergens, J. L. (2009). The impact of risk and uncertainty on expected returns. *Journal of Financial Economics*, 94(2), 233-263.
- Baker, M., & Wurgler, J. (2006). Investor Sentiment and the Cross-Section of Stock Returns. *The Journal of Finance*, 61(4), 1645-1680.
- Baker, M., & Wurgler, J. (2007). Investor Sentiment in the Stock Market. *The Journal of Economic Perspectives*, 21(2), 129-151.
- Bartov, E., Radhakrishnan, S., & Krinsky, I. (2000). Investor Sophistication and Patterns in Stock Returns after Earnings Announcements. *The Accounting Review*, 75(1), 43-63.
- Beekes, W., & Brown, P. (2006). Do Better-Governed Australian Firms Make More Informative Disclosures? *Journal of Business Finance & Accounting*, 33(3-4), 422-450.
- Beekes, W., Brown, P., Zhan, W., & Zhang, Q. (2016). Corporate Governance, Companies' Disclosure Practices and Market Transparency: A Cross Country Study. *Journal of Business Finance & Accounting*, 43(3-4), 263-297.
- Bernard, V. L., & Thomas, J. K. (1989). Post-Earnings-Announcement Drift: Delayed Price Response or Risk Premium? *Journal of Accounting Research*, 27, 1-36.
- Bernard, V. L., & Thomas, J. K. (1990). Evidence that stock prices do not fully reflect the implications of current earnings for future earnings. *Journal of Accounting and Economics*, 13(4), 305-340.
- Bharath, S. T., Pasquariello, P., & Wu, G. (2009). Does Asymmetric Information Drive Capital Structure Decisions? *The Review of Financial Studies*, 22(8), 3211-3243.
- Bhat, G., Hope, O.-K., & Kang, T. (2006). Does corporate governance transparency affect the accuracy of analyst forecasts? *Accounting & Finance*, 46(5), 715-732.
- Bird, R., Choi, D. F. S., & Yeung, D. (2014). Market uncertainty, market sentiment, and the post-earnings announcement drift. *Review of Quantitative Finance and Accounting*, 43(1), 45-73.
- Bird, R., & Yeung, D. (2012). How do investors react under uncertainty? *Pacific-Basin Finance Journal*, 20(2), 310-327.
- Bloom, N. (2009). The Impact of Uncertainty Shocks. *Econometrica*, 77(3), 623-685.
- Bonetti, P., Magnan, M. L., & Parbonetti, A. (2016). The Influence of Country- and Firm-level Governance on Financial Reporting Quality: Revisiting the Evidence. *Journal of Business Finance & Accounting*, 43(9-10), 1059-1094.
- Brav, A., & Heaton, J. B. (2002). Competing Theories of Financial Anomalies. *The Review of Financial Studies*, 15(2), 575-606.
- Brown, G. W., & Cliff, M. T. (2004). Investor sentiment and the near-term stock market. *Journal of Empirical Finance*, 11(1), 1-27.
- Brown, L. D., & Caylor, M. L. (2006). Corporate governance and firm valuation. *Journal of Accounting and Public Policy*, 25(4), 409-434.
- Brown, P., Beekes, W., & Verhoeven, P. (2011). Corporate governance, accounting and finance: A review. *Accounting & Finance*, 51(1), 96-172.
- Byard, D., Li, Y., & Weintrop, J. (2006). Corporate governance and the quality of financial analysts' information. *Journal of Accounting and Public Policy*, 25(5), 609-625.
- Cai, C. X., Keasey, K., & Short, H. (2006). Corporate Governance and Information Efficiency in Security Markets. *European Financial Management*, 12(5), 763-787.
- Caskey, J. A. (2009). Information in Equity Markets with Ambiguity-Averse Investors. *The Review of Financial Studies*, 22(9), 3595-3627.

- Chen, Z., & Epstein, L. (2002). Ambiguity, Risk, and Asset Returns in Continuous Time. *Econometrica*, 70(4), 1403-1443.
- Chen, Y., Chen, D., Weimin Wang, W., & Zheng, D., (2018), Political uncertainty and firms' information environment: Evidence from China. *Journal of Accounting and Public Policy*, 37(1), 39-64.
- Choi, H. m. (2014). When Good News Is Not So Good: Economy-wide Uncertainty and Stock Returns. *Journal of Business Finance & Accounting*, 41(9-10), 1101-1123.
- Chung, S.-L., Hung, C.-H., & Yeh, C.-Y. (2012). When does investor sentiment predict stock returns? *Journal of Empirical Finance*, 19(2), 217-240.
- Connolly, R., Stivers, C., & Sun, L. (2005). Stock Market Uncertainty and the Stock-Bond Return Relation. *The Journal of Financial and Quantitative Analysis*, 40(1), 161-194.
- Conrad, J., Cornell, B., & Landsman, W. R. (2002). When Is Bad News Really Bad News? *The Journal of Finance*, 57(6), 2507-2532.
- Dargenidou, C., McLeay, S., & Raonic, I. (2007). Ownership, Investor Protection and Earnings Expectations. *Journal of Business Finance & Accounting*, 34(1-2), 247-268.
- David, A., & Veronesi, P. (2002). *Option Prices with Uncertain Fundamentals*. Working Paper. University of Chicago.
- De Long, J. B., Shleifer, A., Summers, L. H., & Waldmann, R. J. (1990). Noise Trader Risk in Financial Markets. *Journal of Political Economy*, 98(4), 703-738.
- DeFond, M., Hung, M., & Trezevant, R. (2007). Investor protection and the information content of annual earnings announcements: International evidence. *Journal of Accounting and Economics*, 43(1), 37-67.
- Dixit, A., & Pindyck, R., (1994). *Investment under Uncertainty*. Princeton University Press.
- Doyle, J. T., Lundholm, R. J., & Soliman, M. T. (2006). The Extreme Future Stock Returns following I/B/E/S Earnings Surprises. *Journal of Accounting Research*, 44(5), 849-887.
- Draper, P., & Paudyal, K. (2008). Information Asymmetry and Bidders' Gains. *Journal of Business Finance & Accounting*, 35(3-4), 376-405.
- Drechsler, I. (2013). Uncertainty, Time-Varying Fear, and Asset Prices. *The Journal of Finance*, 68(5), 1843-1889.
- Epstein, L. G., & Schneider, M. (2008). Ambiguity, Information Quality, and Asset Pricing. *The Journal of Finance*, 63(1), 197-228.
- Francis, J., Lafond, R., Olsson, P., & Schipper, K. (2007). Information Uncertainty and Post-Earnings-Announcement-Drift. *Journal of Business Finance & Accounting*, 34(3-4), 403-433.
- Gerard, X. (2012). Information Uncertainty and the Post Earnings Announcement Drift in Europe. *Financial Analysts Journal*, 68(2), 51-69.
- Hass, L. H., Vergauwe, S., & Zhang, Q. (2014). Corporate governance and the information environment: Evidence from Chinese stock markets. *International Review of Financial Analysis*, 36, 106-119.
- Jiang, G., Lee, C. M. C., & Zhang, Y. (2005). Information Uncertainty and Expected Returns. *Review of Accounting Studies*, 10(2), 185-221.
- Kang, W., Lee, K., & Ratti, R.A. (2014) Economic policy uncertainty and firm-level investment. *Journal of Macroeconomics*, 39(A), 42-53.
- Kanagaretnam, K., Lobo, G. J., & Whalen, D. J. (2007). Does good corporate governance reduce information asymmetry around quarterly earnings announcements? *Journal of Accounting and Public Policy*, 26(4), 497-522.
- Keynes, J. M. (1937). The General Theory of Employment. *The Quarterly Journal of Economics*, 51(2), 209-223.
- Knight, F. H. (1921). *Risk, Uncertainty and Profit*. Boston: Houghton Mifflin Company.
- Kothari, S. P., & Warner, J. B. (2007). Chapter 1 - Econometrics of Event Studies. In B. E. Eckbo (Ed.), *Handbook of Empirical Corporate Finance* (pp. 3-36). San Diego: Elsevier.
- Krishnaswami, S., & Subramaniam, V. (1999). Information asymmetry, valuation, and the corporate spin-off decision. *Journal of Financial Economics*, 53(1), 73-112.

- Kumar, A. (2009). Hard-to-Value Stocks, Behavioral Biases, and Informed Trading. *Journal of Financial and Quantitative Analysis*, 44(6), 1375-1401.
- Lemmon, M., & Evgenia, P. (2006). Consumer Confidence and Asset Prices: Some Empirical Evidence. *The Review of Financial Studies*, 19(4), 1499-1529.
- Liu, W., Strong, N., & Xu, X. (2003). Post-earnings-announcement Drift in the UK. *European Financial Management*, 9(1), 89-116.
- Livnat, J., & Mendenhall, R. R. (2006). Comparing the Post-Earnings Announcement Drift for Surprises Calculated from Analyst and Time Series Forecasts. *Journal of Accounting Research*, 44(1), 177-205.
- McDonald, R., & Siegel, D., (1986), The Value of Waiting to Invest, *Quarterly Journal of Economics* 101, 706-727.
- MacKinlay, A. C. (1997). Event Studies in Economics and Finance. *Journal of Economic Literature*, 35(1), 13-39.
- Mendenhall, R. R. (2004). Arbitrage Risk and Post Earnings Announcement Drift. *The Journal of Business*, 77(4), 875-894.
- Mian, G. M., & Sankaraguruswamy, S. (2012). Investor Sentiment and Stock Market Response to Earnings News. *The Accounting Review*, 87(4), 1357-1384.
- Ozoguz, A. (2009). Good Times or Bad Times? Investors' Uncertainty and Stock Returns. *The Review of Financial Studies*, 22(11), 4377-4422.
- Pevzner, M., Xie, F., & Xin, X. (2015). When firms talk, do investors listen? The role of trust in stock market reactions to corporate earnings announcements. *Journal of Financial Economics*, 117(1), 190-223.
- Rodrik, D., (1991). Policy uncertainty and private investment. *Journal of Development Economics*, 36, 229-242.
- Sadka, R. (2006). Momentum and post-earnings-announcement drift anomalies: The role of liquidity risk. *Journal of Financial Economics*, 80(2), 309-349.
- Van Ness, B. F., Van Ness, R. A., & Warr, R. S. (2001). How Well Do Adverse Selection Components Measure Adverse Selection? *Financial Management*, 30(3), 77-98.
- Williams, C. D. (2015). Asymmetric Responses to Earnings News: A Case for Ambiguity. *Accounting Review*, 90(2), 785-817.
- Zhang, X. F. (2006). Information Uncertainty and Stock Returns. *The Journal of Finance*, 61(1), 105-137.
- Zouaoui, M., Nouyrgat, G., & Beer, F. (2011). How Does Investor Sentiment Affect Stock Market Crises? Evidence from Panel Data. *Financial Review*, 46(4), 723-747.

Appendix I
Definitions of Main Variables

Variable	Definition
Cumulative Abnormal Returns (CAR)	CAR is calculated for the specific period the by subtracting the expected return calculated using the market model (that is, the Capital Asset Pricing Model or CAPM) from the actual return.
Standardized Unexpected Earnings (SUE)	SUE is calculated as: $SUE_{i,t} = \frac{E_{i,t} - \overline{E}_{i,t}}{P_{i,t}}$, Where $E_{i,t}$ is actual quarterly earnings per share for firm i in quarter t , $\overline{E}_{i,t}$ is the most recent consensus analysts' forecast available prior to the announcement of the quarterly earnings per share for firm i in quarter t and $P_{i,t}$ is the price for firm i at the end of the quarter.
Positive SUE (PUE)/Negative SUE (NUE)	PUE/NUE is the positive (negative) SUE measure which takes the value of SUE when it is positive (negative) or 0 otherwise.
Governance (GOVH)	GOVH is a dummy variable which takes the value 1 if the governance index (GOV) value for the announcement year is above the median value for all other observations or 0 otherwise. Higher governance index value indicates better governed firms.
Sentiment (SMIP/PSMIP)	SMIP is a dummy variable which takes the value 1 if the cumulative return on S&P 1500 (sentiment measure) five-days prior to the announcement (SMI) is positive or 0 otherwise. PSMIP is a dummy variable which takes the value 1 if the sum of the daily returns on S&P 1500 (sentiment measure) over the post-announcement period (PSMI) is positive or 0 otherwise.
Uncertainty (VIXH/ Δ VIXH)	VIXH is a dummy variable which takes the value 1 if the volatility index or VIX (uncertainty measure) value one day prior to the announcement (VIX) is above the median value for all VIX observations or 0 otherwise. Δ VIXH is a dummy variable that measures change in VIX (uncertainty measure) over the studied period (Δ VIX) and takes the value 1 if the value of VIX increases over post announcement period (T+2 to T+60) or 0 otherwise.
Information Uncertainty (IFUH)	IFUH takes the value 1 if the value of the IU measure (defined in <i>Table I</i>) for the announcement year is above the median value for all other observations or 0 otherwise. The IU measures are constructed so that higher values indicate higher IU.
SIZE	SIZE is the log of the firm's market value at the time of the announcement.
BTMV	BTMV is the firm's book-to-market value ratio at the time of the announcement.
FORC	FORC is the number of reported earnings forecasts for the quarter in I/B/E/S database.
RLAG	RLAG is the number of days from the end of the reporting period to the announcement date.

Appendix II

Corporate Governance Thresholds

provided by the ISS Governance QuickScore 3.0 Attributes

Board Structure and Policies

1. Average attendance of board meetings is at least 75%
2. Board is controlled by more than 50% independent outside directors
3. Board size is not less than six but not greater than 15
4. Board is made up of at least 25% females
5. No former CEO on the board
6. At least 50 percent of board members have external financial expertise
7. Chairman and CEO are separated
8. Compensation committee is composed of independent directors only
9. Nominating committee is composed of independent directors only
10. Audit committee is composed of independent directors only
11. Governance committee or similar committee exists
12. Average number of other corporate affiliations for the board member not greater than four
13. Governance guidelines are publicly disclosed
14. No staggered board (frequently elected board)
15. Majority vote requirement to amend charter/bylaws (no rights to vote or supermajority required)
16. No limitations on shareholders' right to remove board members (that is, only for cause, supermajority vote required, etc.)
17. Performance of the board is reviewed regularly
18. Cumulative voting rights for shareholders
19. A succession plan for executives is in place

Anti-Takeover Provisions

20. Single class, common
 21. Majority vote requirement to approve significant company transitions such as mergers and acquisitions (no rights to vote or supermajority required)
 22. The company does not have a golden parachute or other similar clauses (compensation plan for accelerated pay-out)
 23. No limitations on shareholders' rights to call special meetings
 24. Company has no poison pill provisions
 25. The company has less than five anti-takeover devices in place
 26. The company does not have unlimited authorized capital or a blank check
 27. The company is not owned by a reference shareholder who has the majority of the voting rights, veto power or golden share
 28. The company permits actions to be taken without meeting by written consent
 29. Percentage of shares held by all insiders and 5 percent owners is less than 50 percent
-

Footnotes

- ¹ Although similar studies use a longer time-period, we use a shorter time period due to the limited availability of governance data, especially for the earlier years.
- ² We limit our study to S&P 1500 firms because our governance database primarily covers members of this index.
- ³ We drop 3,831 observations from our sample due to lack of either forecast data or governance data or both.
- ⁴ Livnat and Mendenhall (2006) and Doyle *et al.* (2006) report that the PEAD tends to be significantly larger when analysts' forecasts are used in the measurement of unexpected earnings. Furthermore, Livnat and Mendenhall report that measurement methods using analysts' forecasts and those using time-series models may capture different forms of mispricing. For the sake of comprehensiveness, we follow Livnat and Mendenhall (2006) and calculate another measure of SUE that is based on historical earnings to use in our robustness tests:

$$HSUE_{i,t} = \frac{E_{i,t} - E_{i,t-4}}{P_{i,t}}$$

where $E_{i,t}$ is actual quarterly earnings per share for firm i in quarter t and $E_{i,t-4}$ is the is actual quarterly earnings per share for firm i in the same quarter of last year. In line with Livnat and Mendenhall (2006) and Doyle *et al.* (2006), we find that repeating the same analysis with the historical measure provides similar but weaker results.

- ⁵ Thresholds for different governance measures are provided in the appendix. The variables were selected to best represent and capture the corporate governance framework of the firm.
- ⁶ As a result of this restriction we drop 6,451 observations from our sample.
- ⁷ Bharath *et al.* (2009) and Krishnaswami and Subramaniam (1999) report that many of the information asymmetry measures used in the literature are highly and significantly correlated.
- ⁸ We define the post-announcement period as T+2 to T+60 to cover the period between the current and future quarterly announcements (3 months).
- ⁹ The results remain unchanged when using the market-adjusted model which calculates the abnormal return by subtracting the daily market return (that is, S&P 1500) from the actual daily stock return based on the size decile.
- ¹⁰ There were a number of other control variables suggested in the literature such as having dummy variables to indicate if the firm has announced negative earnings or if it falls in the largest 20 firms in the country (for example, DeFond *et al.* 2007, Pevzner *et al.* 2015), which we decided to not include as we account for size and negative earnings through our SIZE variables and having separate indicators for bad and good news in our independent variables. Another variable which we include at a later stage as part of measuring information uncertainty is the dispersion in analysts' forecast.
- ¹¹ For instance, the term $GOVH_{i,t} \times NUE_{i,t}$ has a direct impact (reported as part of the main regression) and an indirect impact through $IFUH_{i,t} \times NUE_{i,t}$ which is reported in the indirect impact section.
- ¹² We specify the individual measures so that higher score means better governance.
- ¹³ We use the detrended stock turnover instead of other measures used in the literature such as the quarterly Economic Forecaster Disagreement measure and the monthly Economic Policy Uncertainty measure due to the higher frequency of the first measure. This allows us to better capture intra-month and/or intra-quarter changes in uncertainty conditions.

-
- ¹⁴ There are few alternative measures to measure market sentiment such as the put-call ratio or the bull-bear ratio. However, it can be argued that while only available on a monthly-basis, the sentiment index published by Baker and Wurgler provides a more comprehensive reflection of market sentiment.
- ¹⁵ The six sentiment measures are: trading volume; dividend premium; closed-end fund discount; number of IPOs and average first day returns; equity share in new issues. The authors update their calculations of the index on frequent basis and publish their calculations online at: (<http://people.stern.nyu.edu/jwurgler/>).
- ¹⁶ While we only report the results where all alternative variables are used at once, the results where each alternative variable is added separately gives similar conclusions.