

Event vs. Issue: Twitter Reflections of Major News, a Case Study

Chris J. Vargo\*, Ekaterina Basilaia\*\* & Donald Lewis Shaw\*\*\*

\* The University of Alabama

\*\* Tbilisi State University

\*\*\* University of North Carolina at Chapel Hill

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Abstract:

An issue and event were tracked for 90 days on Twitter, cable television and large newspapers.

The mortgage and housing crisis was an ongoing issue, and the BP oil spill was an ongoing event. As expected, the results suggest media as a predictor of Twitter for the two issue agendas studied. However, this study shows that the agenda-setting effects on Twitter are not equal in regard to issues and events. The agenda-setting effect of the media appeared to be stronger for the issue observed here. Moreover, initial evidence is provided that agendas for the ongoing events were more volatile than ongoing issues. For ongoing events, it appears that agendas are most reflective of the real-world cues that initiate them. This suggests that when real-world cues are largely absent, the media are less salient, and the agenda is more stable and ongoing. Finally, increased temporality appears to better reveal agenda-setting effects for events. Relaxed temporal measures appear to reveal the agenda-setting effect of ongoing issues more effectively. Events are not all equal; neither are issues. As such, the media and Twitter behave differently. This distinction has not yet been made in the literature.

Keywords: Twitter, agenda setting, television, newspapers, issues, events

## Introduction

On May 1, 2011 at 9:24 p.m., a tweet from Donald Rumsfeld's chief of staff, Keith Urbahn, told the world that Osama Bin Laden was killed by the United States (Urbahn, 2011). Journalists soon picked up the event and amplified it through traditional media to the general public (Weisenthal, 2011). Two hours later, President Barack Obama officially reciprocated the news. On another occasion, tweets first showed the Boston marathon bombings (Thielman, 2013). Again, the news media spread the content to a larger audience shortly thereafter (Thielman, 2013). The evolution of social media has transformed all of us into potential reporters. Scholars Willnat and Weaver have documented through exhaustive surveys that reporters routinely monitor tweets, among other social media, as a way of scanning the public environment (Willnat & Weaver, 2014). Still, citizens and social media have not replaced traditional media in informing the general public about the important events of public life. Instead, this paper discusses how Twitter traces at least one aspect of the public response to news.

This study focuses on how Twitter was used to spread information about a major news event and an ongoing social issue. It shows when Twitter users responded to newspaper and television news about the BP oil spill and the mortgage and housing crisis. The findings suggest that audiences respond somewhat differently to events (i.e. disasters like the BP oil spill) than they do to ongoing issues such as the mortgage crisis. A potential difference in the "social echoes" created by issues vs. events emerges. In both cases, Twitter provides rumbling social echoes to these news events, but in different ways. This paper also confirms traditional agenda-setting theory, which would stipulate that Twitter acts as an audience response to newspaper and television news agendas for the BP oil spill and the mortgage and housing crisis of 2011.

## Literature Review

In the 1990s came email, and in the early 2000s came Facebook, YouTube and Twitter. All these media are used to connect individuals with the news. From the beginning, news events have been amplified by newspapers, magazines, radio, television and now newer media. Generally, the path has been for events to occur, to be observed eventually by journalists and for the traditional news media to spread the word to larger audiences (McCombs, Overholser & Jamieson, 2005; Rogers, Dearing & Chang, 2002). Journalists are not always at the location of events such as bombings or train wrecks. As mentioned earlier, in these cases, citizen observers are usually involved with these events. In the pre-Internet times, these individuals brought back word of the events by foot, horse, or by telegraph or telephone. Today, our ability to be the first reporter at events has been greatly extended by the Internet of connected devices. We easily can use Twitter to spread the word to larger audiences of friends and citizens.

Following Facebook in 2006, Twitter gained popularity as a micro-blogging service. In a world of many social media services, Twitter differentiates itself in two ways: messages are public and brief. The majority of information created by users is open for all to see (Vieweg, 2010). This is different from Facebook, on which the majority of the content is perceived to be private (e.g. person-to-person) or semi-private (e.g. person to a contained network of people) (Kwak, Park & Moon, 2010). Twitter has placed an emphasis on being a public medium by calling itself "...a platform for you to influence what's being talked about around the world..." (About Us, 2010). Users of Twitter follow other users, but relationships are often not reciprocal. Few users gather many followers, while many users gather a few (Vargo, 2013a). Users follow a mix of sources ranging from news services to celebrities. Like Facebook, messages from those users are curated into a person's news feed. Those messages (i.e. "tweets") are posts or status

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updates. The term is as much a play on the size of the message as it is on the audible similarity to Twitter. A tweet can be a combination of any 140 characters. The origin of the character limit can be traced to Twitter's origin as a text messaging service, but it is now embraced as a distinctive characteristic of the service.

In its formative years, Twitter was primarily used on desktop computers. Now, 75 percent of Twitter's traffic is generated from mobile devices (Protalinski, 2013). Twitter reaches a large segment of the world, touting 215 million active users (Protalinski, 2013). Despite having more users under the age of 30, Pew Research shows that major demographics of all varieties in America are represented on Twitter (See Table 1).

### **Take in Table 1 Here**

While people can broadcast any topic they choose, Catone has developed a typology of tweets (2008). Catone's typology relies on the concept of a meme. Biologist Richard Dawkins first proposed the term "meme" in 1976. The term was coined to describe a biological occurrence in which lots of individual units (the cultural equivalent of genes) undergo variation, selection and retention (Heath, Bell, Sternberg, 2001). His idea also accounted for constant competitions that memes go through. He noted that cultural memes do not compete solely on truth or newsworthiness alone. Instead other factors, such as novelty, dictate which memes are selected and retained in society. This may explain why Syria does not trend highly on Twitter, but sports, humor and entertainment do (Goel, Watts & Goldstein, 2012). Dawkins was perhaps one of the first to study how ideas propagate using a variation, selection and retention approach (Heath, Bell and Sternberg, 2001). Memes are not new to the social media era. For much of history, certain memes have

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survived competition in the marketplace of ideas. Dawkins provides examples in his book that include chain letters and rumors (1976).

In a content analysis of Twitter, Catone finds that memes do exist on Twitter. His definition of memes however, varies slightly (2008). First, he recognizes that not everything posted to Twitter is intended to be a meme. Users post status updates of everyday occurrences (i.e. what a user ate for lunch or delays experienced at an airport). Second, there are short-term memes, which he defines as temporal events that are of interest to a larger audience.

Conversations can last from a few minutes to a few hours. For example, a television show will have some buzz before, during and for a short time after the show airs. The final type of discussion widely observed on Twitter refers to long-term memes. Long-term memes are topics of interest that people talk about for days, weeks or even months. Catone observes politics and new video games as examples of longer-term discussions happening on the service (2008).

As Twitter begins to attract wider demographics, tweets can be thought of as representation of what the public is saying. Many companies and politicians have begun to use Twitter as a search engine of public opinion. Some political consultants argue that the most accurate way to measure public sentiment is to evaluate the issue in question on Twitter (Brustein, 2010; Catone, 2008; Kwak, Park & Moon, 2010 ).

One true innovation of Twitter – the reason why this social networking tool lends itself well to data analysis – is the fact that virtually all of the tweets on Twitter are searchable and quantifiable. Various search tools have been created using Twitter’s API that track trends, daily mentions and keywords on Twitter. These tools make Twitter a viable option for quantitative research (Java & Song, 2007). For instance, Twitter has been analyzed to discover breaking news, as a forum for

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analyzing media events, as a mechanism for language learning and even for detecting natural disasters in real time (Michelson & Macskassy, 2010). Twitter is already regarded as an electronic word-of-mouth platform for businesses seeking to gauge consumers' feelings about certain products (Jansen, Zhang, Sobel & Chowdury, 2009). Jansen found that Twitter users enjoy commenting on subjects that they think about in everyday life. While he cited that 19 percent of these postings often involved a brand or product, he also noted that Twitter users were increasingly likely to post about a product if it was "newsworthy" or if the brand was related to a current event. The study was able to effectively scope how Twitter users felt about certain brands. Expanding on this idea, other studies have suggested that Twitter also effectively summarizes how users feel about events, news stories and persons.

The overwhelming majority of Twitter accounts are created for public viewing. Free for all to see, search and analyze, general accounts are as public as Web pages or blogs. Making public what once was treated as private, Twitter has taken social networking and has progressed it into a scalable and knowable body of information. This discourse can be considered a sample of conversations from all different types of demographics. In this way, tweets themselves can serve as indirect measurements of topics that are salient to the general public. Twitter's body of knowledge should now be considered a part of the ever-changing media landscape.

In 2010, a time-series analysis was applied to political public opinion polls and Twitter messages that mentioned President Barack Obama (O'Connor, Balasubramanian, Routledge & Smith, 2010). Using software that measured for the sentiment in Twitter messages, they were able to compare the public sentiment of Obama to traditionally collected public opinion polls. A high correlation between the two collection methods was found. Authors of the study go as far as to suggest that future uses of Twitter might include the "substitute and supplement [of Twitter

Sentiment Analysis] for traditional polling” and argue that Twitter is an accurate measurement of public opinion.

A large body of literature on Twitter shows that Twitter users as a whole are more intrinsically motivated to tweet as compared to other social networking or microblogging websites (Agrifoglio, Black & Metallo, 2010). Users are not found to tweet to reach external goals, such as visibility, or to reach perceived-expert status on a topic. Instead, typical users tweet for the pure enjoyment of interacting with the platform itself. This lack of extrinsic motivation allows users to tweet more candidly and without external motivation bias. The lack of external motivation encourages users to post without reservation or polarized opinion while still exhibiting high levels of involvement. However, in their study to discover adult users’ topics of interest on Twitter, Michelson and Macskassy (2010) argued that an individual’s Twitter use is not only affected by the value that can be obtained through using the service, but also by the external forces of the society to which the user belongs. In their study, the researchers concluded that the more people consider an innovation to be acceptable or recommendable, the more the intrinsic and extrinsic motivation to use the innovation increases. Furthermore, the findings demonstrated that users have an incentive to provide untrustworthy information if it gives them their desired social image and social identity in an online space.

### **Conceptual explication of salience**

As mentioned earlier, salience is the key measurement in agenda-setting studies (McCombs, 1999). Virtually all agenda-setting studies include two measurements of the concept of salience. There is no one, single scholarly accepted definition of the word salience. Instead, while not quite a word of implicitly, salience almost implies a definition. This assumption of definition is dangerous. The result is several segmented the uses of the word in related but

different directions. This explication looks at the most popular scholarly uses of the word salience. The majority of these applications come from a wide variety of media and psychological research (Evatt, 1997). Salience has been giving meanings roughly equivalent to: importance, interest, conspicuousness, relevance and awareness. Additionally, perhaps the closest in relationship, the concept involvement is also compared and contrasted.

### **Contemporary Agenda Setting: Social Networking, Digital Media & the Internet**

Agenda setting theory has continued to evolve since its conception. Since the theory is so well established, it would be quite a task to cover all of the developments agenda setting has underwent since the conception. This paper only attempts to address parts of agenda setting that apply to the digital media realm.

There has been a marginal amount of research on the Internet and how it might apply to the germinal findings of agenda setting theory. Older forms of Internet-fueled communication tools, such as bulletin boards and chat rooms, have been found to follow the agendas set by traditional media (McCombs, Overholser & Jamieson, 2005; Rogers, Dearing & Chang, 2002). More recently, Blog agendas have also been shown to follow the agendas of mainstream media (Lee, 2007). Overall, the body of research from the last century suggests that media salience predicts public salience on the Web (Weeks & Southwell, 2010; Bode, Sayre, Shah, Shah & Wilcox., 2010).

Newer articles have tackled Internet-driven social media. In a 2010 preliminary study of agenda setting and YouTube, Bode, Sayre, Shah, Shah & Wilcox investigated if, when and to what degree videos posted on YouTube may have led or followed traditional news media. They looked at one specific issue: California's Proposition 8, a controversial ballot proposition that would redefine the laws of marriage. The study took daily frequency counts for the story in national cable news programs, national newspapers and YouTube video uploads. The study then applied ARIMA time-

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series analysis to the three frequency counts and identified when and how traditional media led or followed YouTube content. While the findings had no single time-series model that could fit the entire 14 months in which the study was conducted, some significant conclusions could still be drawn. YouTube was found to both follow and lead. Prior to the day during which the public voted on Proposition 8, YouTube public salience followed mainstream media salience. However, following the election, YouTube public salience was found to lead the way. Speculation aside, the change seen immediately following the vote could not be empirically explained.

Another 2010 study looked at mainstream media and a new measurement, Google Trends, for a possible correlation. That study explored a potential relationship between mainstream media coverage of a particular political rumor concerning Barack Obama being a Muslim and its public salience as measured by online search activity. The results showed that mainstream media coverage, especially television coverage, influenced Google Trends' public salience of the political rumor. This study supports and reinforces the original definition of agenda setting. It suggests that mainstream media still have the power to influence public salience. The study also shows that the results of agenda setting were most greatly seen the same day. Days in which an issue received increased coverage in mainstream media, in turn, showed a positive response in Google Trends. The study showed that the agenda-setting effect began to wear off on Google Trends as early as day two and all but vanished by days three and four (Weeks & Southwell, 2010). Weeks & Southwell concluded by calling for the need to investigate possible variables that may have affected the correlation between Google Trends and the traditional mainstream media. They cited blogs as the possible mediating source. The study opens the possibility that reporters and writers for mainstream media could be influenced by blogs they read. Such research acts as an invitation for an agenda-setting investigation to be conducted on Twitter, the world's most popular microblogging platform.

### **Issues and Events in Journalistic and Public Agendas**

The scholarly literature on agenda setting was reviewed to discover if scholars differentiate between issues and events. While the body of agenda-setting literature is wide, no sources addressed the underlying differences between the two concepts. This paper is perhaps the first that tests the assumption that the agenda-setting effect is not the same for all news stories. Here, we draw the distinction that issues are not the same as events. Not every news story results in continued journalistic and public interest. Consider an event as a limited occurrence; a sudden agenda that hikes up from time to time. Events are most often generated from the occurrence of a real-world cue (i.e. an earthquake, bombing or missing airplane). Their scope and perhaps significance ascribed to them by journalists and public rarely create strong and steady public discourse. Instead, coverage and debate usually hovers around the factual occurrences of the real-world cue.

We suggest that issues however, are deeply embedded in public cognition. They generate meaningful and powerful discourse. These concerns are usually personal, and ultimately in the greater public interest. Attention issues are usually long-lived. Issues, such as wars, LGBT rights or economic turmoil, can go on for years. While these issues may have events embedded within them (i.e. an invasion of a city, the legalization of same-sex marriage in Pennsylvania or a stock market crash), the issues themselves have longer lives than the sum of all the events.

## Hypotheses

This paper expected to see an agenda-setting effect similar to one observed in recent studies that incorporated digital measurements of public salience, YouTube and Google Trends (Weeks & Southwell, 2010; Bode, Sayre, Shah, Shah & Wilcox., 2010). Twitter provides a similar measurement that also tracks the overall public popularity of issues over time. The observations gathered in the YouTube and Google Trends studies were in general agreement with one another. Moreover, the studies were in agreement with the general body of agenda-setting work that states that media salience should be a predictor for public salience (Rogers, Dearing & Chang, 2002).

This paper also expected agenda-setting effects to be more rapid than agenda setting on more traditional media. This acceleration has largely been attributed to the ability to instantly post news and opinions on new digital media, such as Twitter. Public opinion was once a calculation that was set on intervals of a day or larger. Digital media, such as Twitter, now allow real-time, constant collection. With these changes to the collection of public opinion and using new digital media agenda-setting studies as a guide, this paper expected to see an accelerated effect that occurred on the same day. The effect observed for all three sampled of booming news issues agenda setting research states that the effect observed should be similar for both newspapers and television (Wanta & Foote, 1994).

H1: A day's mainstream television coverage of selected issues is a positive predictor of the volume of tweets published on that same day.

H2: A day's mainstream newspaper coverage of selected issues is a positive predictor of the volume of tweets published on that same day.

H3: Media salience will transfer to public salience with a zero day lag and be the strongest on the same day.

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In this paper, we also set out to investigate the difference between issues and events. Events are temporal and usually founded in real-world cues. Issues go on for longer periods and can be relatively less salient in the media and the public. Does this distinction account for the change in public agendas and consequently, changes in the intensity of public responses? Or do issues and events behave similarly on Twitter?

H4: An ongoing event will generate “spikes” of public salience on Twitter, mimicking real-world cues.

H5: A news issue will generate declining, but less volatile, counts of public salience.

H6: Because of the presence of real-world cues, the agenda-setting effect for events will be higher than for ongoing issues.

H7: The agenda-setting effect will be more pronounced in shorter time intervals for events, and at longer intervals for issues.

## Method

### Issue Selection

To test the hypotheses and identify a potential agenda-setting effect in Twitter, key issues that exist on a nationwide scale were selected on *tweetReports.com* for monitoring. The overarching goal was to choose ongoing issues that had little chance of immediate resolution. Salient public issues with an ongoing flow of coverage provided the best data in which to analyze. Several issues were analyzed. Issues needed to have search terms that were unique enough to report highly correlated results. Issues had to also have the potential for longevity, as the study needed to run for at least a month to obtain enough data. Several issues were tried against these criteria. Given the search constraints, only issues that had frequent and accurate results were selected. The two issues that satisfied these conditions were found to be: the BP oil spill and the mortgage and housing crisis.

The BP oil spill occurred just 42 miles away from the coast of Louisiana. It is recognized as the worst oil spill in the history of the United States. On the evening of April 20, 2010, a gas release and subsequent explosion occurred on the Deepwater Horizon oil rig working on the Macondo exploration well for BP in the Gulf of Mexico. Eleven people died as a result of the accident and others were injured. Before the well was contained on July 15, 2010, a substantial amount of oil spilled into the Gulf of Mexico, which according to BP official data, amounted to 3.2 million barrels ([www.bp.com](http://www.bp.com)). Until now, the ongoing studies illustrate the difficulty of calculating a death toll in geographically difficult circumstances. The scientists say the challenge will be determining what effects the losses will have on the area's ecology (Schropemay, 2014).

In the summer of 2007, the United States experienced a striking issue of credit market collapse, which affected the lives of millions of Americans. The crisis was the bursting in the United States housing bubble, which peaked earlier in 2006. Chairman Ben S. Bernanke declared

that the problems in housing and mortgage markets became intertwined with broader financial and economic developments (Bernanke, 2008). The housing crisis affected all income levels in all parts of our region. Even people who have remained current may see their property values drop as the number of foreclosures in the neighborhood increases. It continues to weigh on the region's recovering housing market (Snyder & Young, 2013).

We argue that these two issues are different in one key way. The oil spill was an ongoing event during which many attempts were made to stop the flow of oil. Until the oil was stopped, the event continued along with news coverage. While it was ongoing, coverage was primarily fueled by real-world cues, or events that occurred (i.e. a failed attempt to plug the spill). As many scholars have written, the news and public agendas are bound to real-world cues (Behr & Iyengar, 1985; Ebring, Goldenberg & Miller, 1985). The mortgage and housing crisis had real-world cues, but the nature of those cues were fewer and further between. Instead, news coverage appeared to be more speculative and debate-driven. As such, we label the BP oil spill as an ongoing event, and the mortgage and housing crisis as an ongoing issue.

### **Quantifying and Analyzing tweets**

Ideally, this paper would have chosen issues that occurred in the past. Following prior studies, a look at archives of newspapers, television transcripts and tweets would reveal the dates and frequencies of coverage on these issues. Unfortunately, while one can monitor current issues using Twitter search methods, Twitter did not provide exhaustive archives of past tweets. With that limitation in mind, issues had to be tracked on a daily basis. As mentioned earlier, Twitter's public search engine is not exhaustive. In fact, it fails to even provide a comprehensive search of tweets from any given day. Instead, it caps its searches at 1,500 results per query. Fortunately, third-party

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Twitter search options exist. Again, these search engines did not include exhaustive tweet archives from the past but did allow exhaustive daily reporting when tracking keywords.

The issues chosen and tracked were premeditated. *tweetReports.com* was chosen for its third party Application Program Interface (API) connection to Twitter. It offers the ability to deliver daily reports on custom keyword searches. 10 different variations of each keyword were selected from TweetReports topic clustering tool. Of the first 2,000 stories received, 500 were randomly selected and coded by two coders for topical relevance. After many sample searches, the term “bp oil” was found to be the most accurate search term through a manual content analysis ( $a = .92$ ). For the BP Oil crisis. For the Mortgage and housing crisis, “housing crisis” ( $a = .87$ ) and “mortgage crisis” ( $a = .91$ ) results were combined. For each issue that was chosen, a daily frequency count was taken for how many times the topic was mentioned in tweets inside of the United States. For the purposes of this paper, this frequency count represents public salience.

### **Independent Variables: Quantifying and Analyzing Traditional Mass Media**

*The Vanderbilt Television News Archive* served as a representation of the United States national television networks. This archive touts itself as the world’s most extensive and complete archive of television news. It covers regularly scheduled newscasts on *ABC*, *CBS*, *NBC*, *CNN* and *Fox News*. All of the broadcast transcripts from all of the networks for all of the 92 days were manually coded for the relevant topics. The collection range started Oct. 12, 2010 and concluded on Jan. 11, 2011. When a story’s abstract matched one of the selected topics, the article was counted in a daily frequency count. The database also includes the length of time in which news stories run and the time during the broadcast in which they appear. The total duration in number of seconds was recorded for each story that matched the three tracked issues. The time in which the story appeared

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in the broadcast was also coded. These two measurements, alongside a daily frequency count for each issue, were the core measurements of media salience for TV articles.

The final database utilized all of the newspaper articles available from the mainstream national newspapers in the *ProQuest NewsStand* archive. It accessed archives of 10 major newspapers: *The New York Times*, *The Wall Street Journal*, *Washington Post*, *Los Angeles Times*, *The Christian Science Monitor*, *The Atlanta Journal-Constitution*, *The Boston Globe*, *Chicago Tribune*, *Seattle Post-Intelligencer* and *USA Today*. The archive of these 10 United States newspapers provided a representative sample of the overall coverage in the United States. It included an exhaustive daily article and word counts for all mentions of the selected issues. For all of the results that came from an initial search, each article was manually coded and checked for relevance. Only relevant articles were counted.

### **Duration**

The data collection period ran consecutively for 92 days. The time period of three months was chosen to satisfy a requirement of at least 30 to 40 data points, an amount beneficial for a significant ARIMA Time Series Model (Bode, Sayre, Shah, Shah & Wilcox, 2010). The data collection started on Oct. 12, 2010 and concluded on Jan. 11, 2011. Each day, a raw frequency count was taken for all three issues in newspapers, national television news and tweets.

### **ARIMA analysis**

For an agenda-setting effect to occur, there must be evidence to support a transfer from media salience to public salience (Weeks & Southwell, 2010). To detect this possible transfer, an analysis of the variables associated with media salience and public salience had to occur. More specifically, two time-series analyses, one for each issue, had to be calculated. An ARIMA time-

series modeling analysis sufficiently evaluated the effective predictability of each dependent variable.

ARIMA analysis is synonymous with time-series agenda-setting analysis. ARIMA was first proposed for journalism research in 1981 (Maisel & Wunsch, 1981). A decade later, the first noted study to utilize ARIMA in agenda setting occurred in a study of AIDS in the news and public opinion (Rogers, Dearing & Chang 1991). The study had a key advantage over previous time-series analyses in that the ARIMA test was able to better mathematically model stationary and autocorrelation components (Gonzenbach, 1996). Since that breakthrough, the overwhelming majority of agenda-setting research has relied on ARIMA modeling for time series analyses.

This study used ARIMA to mathematically model the three major time series components collected. The results showed how the different time series were related (Gonzenbach, 1996). Understanding the relationship and lag between the variables datasets ultimately addressed all three hypotheses.

Before the ARIMAs were calculated, two additional prerequisite calculations were done to validate the correlation of data sets. First, the dependent variable, tweets, was assessed for a bivariate correlation with the independent variables, media coverage. Then, if significant relationships existed, an ordinary least squares (OLS) regression test, with the Durbin-Watson statistic, was also calculated.

The Durbin-Watson statistic inside of the OLS regression determines the relationship between dependent and independent variables separated from each other by a given time lag. Provided that the Durbin-Watson assessment could address the autocorrelation of the dependent and independent variables, then the autocorrelation was a violation of typical OLS assumptions. If the

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bivariate correlations were also significant, and the autocorrelation check was satisfied, the ARIMA model could then be calculated.

## Results

To test hypotheses H1 and H2, a look at the bivariate relationships between television stories, newspaper stories and same-day tweet volumes for the selected issues was needed. The results are shown in Table 2.

### Take In Table 2 Here

For the issue BP, two independent variables were significant at the .01 level: Television Number of Stories ( $r = .337$ ) and Newspaper Number of Stories ( $r = .374$ ). Additionally, two independent variables were significant at the .05 level: Television Number of Seconds ( $r = .265$ ) and Newspaper Number of Words ( $r = .208$ ). For the second issue, Mortgage and housing crisis, all four independent variables were significantly correlated at the .01 level: Television Number of Seconds ( $r = .514$ ), Television Number of Stories ( $r = .575$ ), Newspaper Number of Stories ( $r = .460$ ) and Newspaper Number of Words ( $r = .395$ ).

Because there was significant correlation for both issues in at least one or more independent variable, at least partial support was expected for H1, H2 and H3. Additionally, an OLS regression was calculated with a Durbin-Watson statistic. The test yielded a 1.85 value for BP Oil and a 1.922 value for Mortgage and housing crisis. All values were less than two and suggested a positive serial correlation among residuals.

An ARIMA 1, 0, 7 model was applied to BP Oil tweets and all of its corresponding independent variables that were significant through bivariate correlation and OLS regression (Table 3). The model found two independent variables to be significant predictors: Television Number of Stories and Newspaper Number of Stories. With a combined  $R^2$  of .486 ( $p < .05$ ) and a non-significant Ljung-Box Q value of .563 ( $p < .10$ ), it was safe to say that the model was correctly specified and that the model used eliminated autocorrelation among residuals.

**Take in Table 3 Here**

An ARIMA 0, 1, 14 model was applied to Mortgage and housing crisis tweets and all of its corresponding independent variables that were significant through bivariate correlation and OLS regression (see Table 4). The model found two independent variables to be significant predictors: Television Number of Seconds and Newspaper Number of Stories. With four outliers, a combined  $R^2$  of .749 ( $p < .05$ ) and a non-significant Ljung-Box Q value of 17.099 ( $p < .10$ ), the model was correctly specified and eliminated autocorrelation among residuals.

**Take in Table 4 Here**

In summary, H1 was given mild support by one or more independent variables for all three issues. H2 was also given mild support by one or more independent variables for BP Oil and The Mortgage and housing crisis issues.

H1 and H2 were given additional support graphically. When the dependent variables and the predicting independent variables were scaled to percentages and graphed over time, similar spikes and trends were shown (Figures 1 & 2). This relationship has been argued as additional predictor support for time series analysis (Wanta & Foote, 1994).

**Take in Figures 1 and 2 Here**

H3 predicted that the correlations between tweets, television coverage and newspaper coverage would be stronger on the same day than compared to the days immediately following the coverage. This hypothesis was also given partial support (see Tables 3 & 4). For all ARIMA calculations, a zero-day lag yield was the only significant correlation. For the issue BP Oil, BP Television Number of Stories ( $p \leq .001$ ) and BP Newspaper Number of stories ( $p = .003$ ) were also significant on the same day. For the issue Mortgage and housing crisis, Television Number of

Seconds and Television Number of Stories were significant on the same day ( $p = .000$ ). Additionally, for Newspaper Number of Stories, the values were also significant on the same day at  $p = .01$

To address H4 through H7, Figures 1, 2, 3 and 4 were assessed. In figures 3 and 4, the data is conflated to by week. Both Figures 1 and 3 give support for H4. The agendas for the oil spill were more volatile. As predicted, this ongoing event appeared to receive spikes of attention. This volatile behavior was not observed for the mortgage and housing crisis agendas. Instead, a steadily declining pattern was observed. This observation provides initial support for H5. It is possible that for issues with few real-world cues, the media have greater agenda-setting effects. Whereas the chaotic nature of events may be better explained by the real-world cues.

#### **Take in Figures 3 and 4 Here**

Table 2 confirms this suggestion. It shows that the agenda-setting effect was strongest for the ongoing issue. Therefore, no support is given to H6. It appears that the presence of real-world cues had little impact on the agenda-setting process. Instead, when no major cues were present, the agenda-setting effect appeared to grow.

Addressing H7, in the daily analysis, it appears that Twitter is more reflexive to the media agenda for the oil spill (Figure 1) than the housing crisis (Figure 2). However, when the analysis is conflated to weeks, the opposite appears to be true. Twitter appears to fit the media coverage surrounding the housing crisis (Figure 4) better than the oil spill coverage (Figure 3). Again, support is given to H7; increased temporality appears to better reveal agenda-setting effects for events. Relaxed temporal measures appear to reveal the agenda-setting effects of ongoing issues more effectively.

## **Conclusion**

The results here show that the media have agenda-setting effects on Twitter. Moreover, this study provides initial evidence that the agenda-setting effect may differ based on the distinction of the occurrence as an event or issue.

### **Agenda-setting Level 1 & Twitter**

As expected, the results suggest media as a predictor of Twitter for the two issue agendas studied. The correlation was most observed in two out of four independent variables for both issues. The mortgage and housing crisis had independent variables Television Number of Seconds, and Newspaper Number of Stories. The BP Oil issue has possible predictors in independent variables Television Number of Stories and Newspaper Number of Stories. Correlations of a same-day, or zero-day, lag were found for all the significant predictor independent variables.

These results are in alignment with recent studies investigating YouTube and Google Trends. Both studies found traditional mainstream media salience to be a predictor of public salience (Weeks & Southwell, 2010) (Bode, Sayre, Shah, Shah & Wilcox, 2010). Weeks's study on Google Trends also found the timing of said agenda-setting effect to be rather instantaneous. Results correlated most highly on the same day. This prediction follows Weeks's findings when examining Google Trends. Research from the study found that results correlated most highly on the same day. While performing a search on Google was not precisely the same as broadcasting a tweet, both are relatively instantaneous and require little premeditation. In these ways, tweets were thought to mimic the temporal effect found with Google.

### **Agenda Setting, Issues vs. Events & Twitter**

This study shows that the agenda-setting effects on Twitter are not equal in regards to issues and events. The agenda-setting effect of the media appeared to be stronger for the issue

observed here. Moreover, initial evidence is provided that agendas for the ongoing events were more volatile than ongoing issues. We suggest that the up and down nature of the attention given to the issue studied here (BP oil spill) was triggered by real-world cues. Those real-world cues led to spikes of attention (a.k.a. salience) in ongoing events. This gives support to existing real-world cues research (Behr & Iyengar, 1985; Ebring, Goldenberg & Miller, 1985). For ongoing events, it appears that agendas are most reflective of the real-world cues that encompass them. Interestingly enough, it appears that issues with real-world cues are less affected by the media agenda. It could well be that the real-world cues are the drivers of the agenda in these cases.

The spiking (a.k.a. volatile) behavior was not observed for the mortgage and housing crisis agendas. Instead, a steadily declining pattern was observed. This suggests that when real-world cues are largely absent, the agenda's salience is less salient and more stable. As aforementioned, it is also stronger in effect. The initial implication here is that for ongoing issues (with little real-world cues) the media are in greater control of the agenda. These issue agendas also likely "take a backseat" to event agendas.

Finally, increased temporality appears to better reveal agenda-setting effects for events. Relaxed temporal measures appear to reveal the agenda-setting effect of ongoing issues more effectively. Here, we suggest the reasons for the flipped conclusions are likely due to the short temporal nature of the oil spill being lost in the weekly analysis. Conversely, the slow, ongoing ebb-and-flow of coverage of the housing crisis appears to be better observed in the weekly analysis. This finding suggests that agenda-setting effects for events are better captured at shorter time intervals, and issues may be better captured at larger intervals. This observation should be taken into account by scholars looking to define their temporal measurement unit.

## Discussion

### Alternate Conclusion: Twitter as the True Influencer

We should ask if the media follow the Twitter rather than lead it. And the media lead. A plausible alternative to hypotheses H1 and H2 was a reverse transfer of agenda setting. Instead of media salience transferring to public salience, it was conceivable that with this new platform, public salience could predict media salience. But separate analysis did not support the alternative hypothesis. See Table 5. In almost every scenario, the Durbin Watson values suggest that the media were the drivers of the agendas.

### Take in Table 5 Here

### Daily Versus Hourly Intervals

The Twitter data provider chosen, *tweetReports.com*, did report tweets at the hourly interval. The *ProQuest* database and *The Vanderbilt Television News Archive*, however, only reported stories at the daily interval. Newer databases that meld several media sources into one, such as Google News, did report news stories at an hourly interval. It would then be possible, given these two databases' intervals, to analyze both against one another at the hourly interval. This opens a possibility for further research that would to better address temporal order issue observed here.

This paper may have better revealed the duration of the agenda-setting transfer if the time interval in the data collection process had been increased. Because the data collected in this paper only allowed analysis at a daily interval and because the agenda-setting effect observed happened so quickly, it was impossible to empirically determine exactly when and in what direction public salience and media salience affected one another. If further studies are conducted at the hourly interval, a directional relationship may be better established. Such a study would set a seminal

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example for agenda setting and online platforms. Currently, no known research exists addressing agenda setting at the hour interval for online media.

### **News Organizations Using Twitter**

While at the time of this paper roughly 95 percent of all Twitter users were consumers, some of the most active Twitter accounts were not public accounts. Instead, they were organizations, companies or news media. There was no easy way to discriminate these tweets from others when taking daily frequency counts. Therefore, in some cases, the tweets that were collected as a measurement of public salience were actually media salience. Some of the most active Twitter accounts on the Web come from sources including *CNN*, *Fox News* and *NBC*. It is also now common procedure for news sources to syndicate their news stories on Twitter as well as on air and in print. This simultaneous reporting method could have inflated or exaggerated the results.

However, it could also be argued that as soon as a tweet was shared or Retweeted by another user of Twitter, it would again be considered public salience and not media salience. Therefore, while news media organizations may have broadcasted a tweet to their large amount of followers, doing so would have only inflated the recorded measurement of tweet frequency by a count of one. Since data was collected solely from the 15 largest national television and newspaper organizations, and only some of these organizations actively rebroadcast stories through Twitter, the total inflation was likely to have been very low.

### **Events Can Evolve Into Issues**

Our data suggest that, as we intuitively know, events are temporal, and issues are ongoing. Events do not always result in continued journalistic and public interest. Of course, issues are related to events. A major earthquake in Turkey is an important event, finite in time, but may not generate any issues in the United States (although it may in Turkey). The BP oil

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spill was an ongoing event. Various efforts to cap the well failed until, finally, the flow of crude oil was scotched. That event or events lasted 86 days. Figure 1 shows the jumping jack nature of news on such events. The oil flows, however, eventually destroyed sea birds, affected commercial fishing, disrupted the tourist and restaurant industries and brought a lengthy period, still ongoing, of recovery. In this case, the event did lead to a variety of issues, loosely covered by reference to the BP oil spill.

The 2011 failure of the banking system was not immediately so catastrophic. At first only major investors, venture capital funds and banks were affected. Most of us did not realize that eventually, the financing of our own homes and small businesses would be affected. Entire 401k retirement accounts shrank like Helium-filled balloons. It took time. In what started as an event, the crash evolved into many issues that now remain topics of journalistic and public interest. To name a few: responsible banking and investment, Federal Reserve oversight of our economic system and whether some businesses are too big to fail. Figure 2 shows yet another illustration of Zipf's law. As the real-world cues from the event subsided, only a small fraction of the shrinking market was covered. Agenda setting is really about saliences. Even in the 1968 agenda-setting study, the news issues were quite general (McCombs & Shaw, 1972). The study included issues: foreign policy, law and order, fiscal policy, public welfare and civil rights. We ask: In the minds of voters in 1968, did foreign policy include the war in Vietnam, our relations with China, our support of NATO in Europe or other concerns?

Contemporary agenda-setting scholarship might consider these specific attributes of the larger topic objects of foreign policy. We suggest that if there are enough journalistic and audience interest in an ongoing event, then, over time, both journalists and audiences add enough attributes so that events evolve into issues that take on lives of their own. But, there is always

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limited media news space as well as limited public attention. Evolving issues are always competing for the restricted space of our collective civic mind. The BP oil spill did slowly evolve into regional issues after the data collection concluded. Even today, a very limited amount of coverage in the media is devoted to the resulting environment and national issues regarding oil exploration safety. The banking failure was, initially, less dramatic but demonstrated longer reach as the entire national economic system became entangled in a spider web spun by the investment community. So when we mention the 2010 BP oil spill or the 2011 mortgage and housing crisis, we are citing more than finite news events because these events gained details as the news evolved. News events, alone, are never issues, but they can become issues as the news evolves and attributes become fixed to the topics. In such a way, the two news events studied here via Twitter did signalize significant journalistic and public issues. Twitter reflects the evolving nature of this process, providing a valuable platform from which we can watch the evolution of our daily civic agenda.

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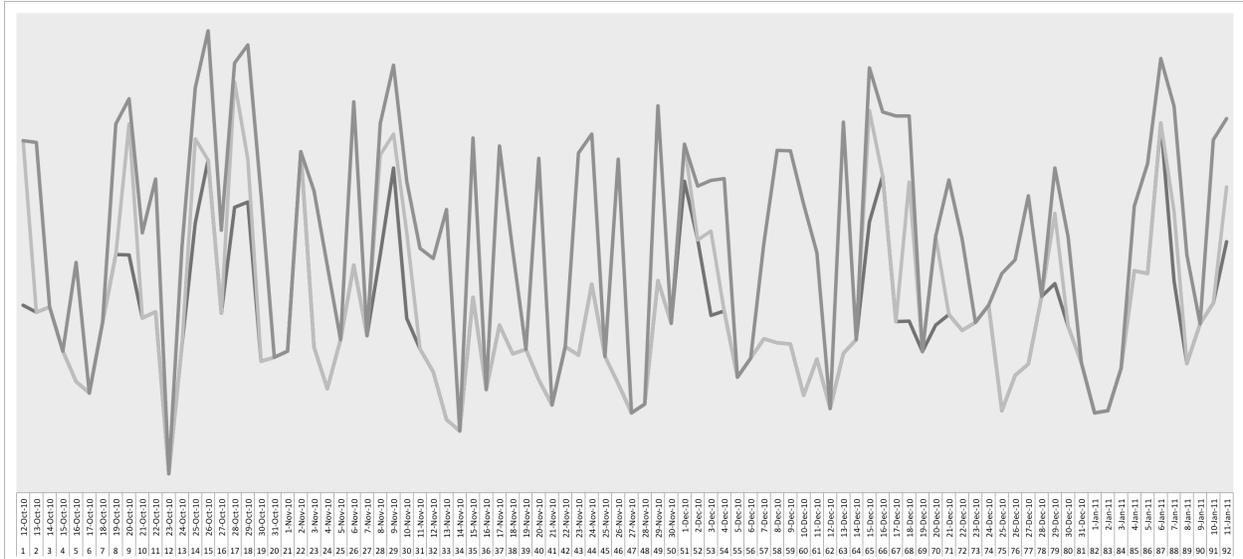
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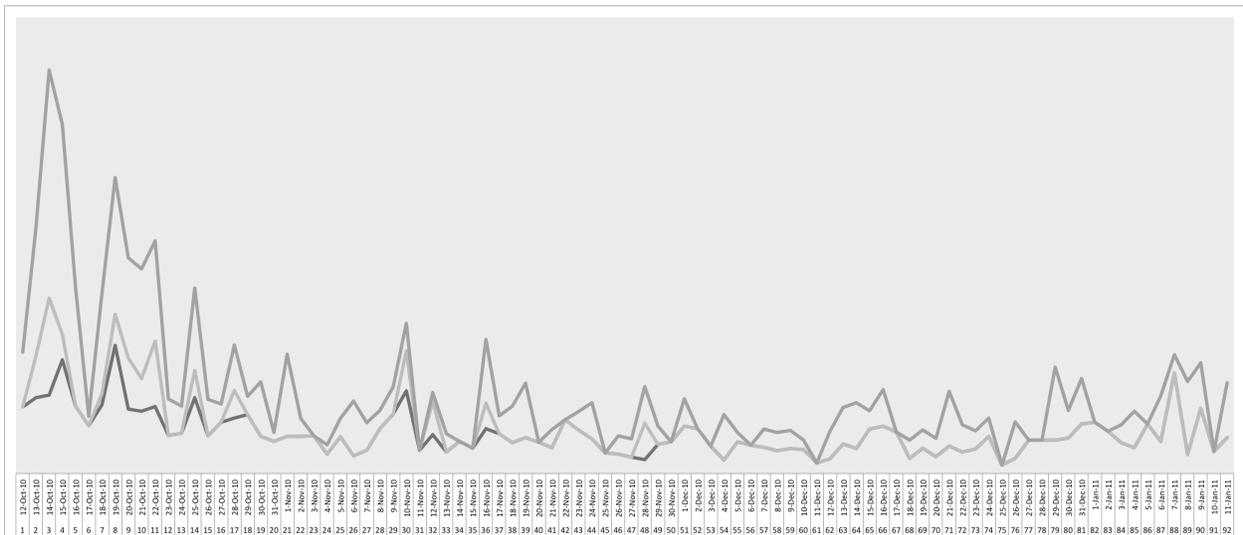
Figures

Figure 1 - Scaled DVs and IVs for Event of BP Oil



\* Blue = Dark Grey; Medium Grey = Newspaper Coverage; Light Grey = TV Coverage

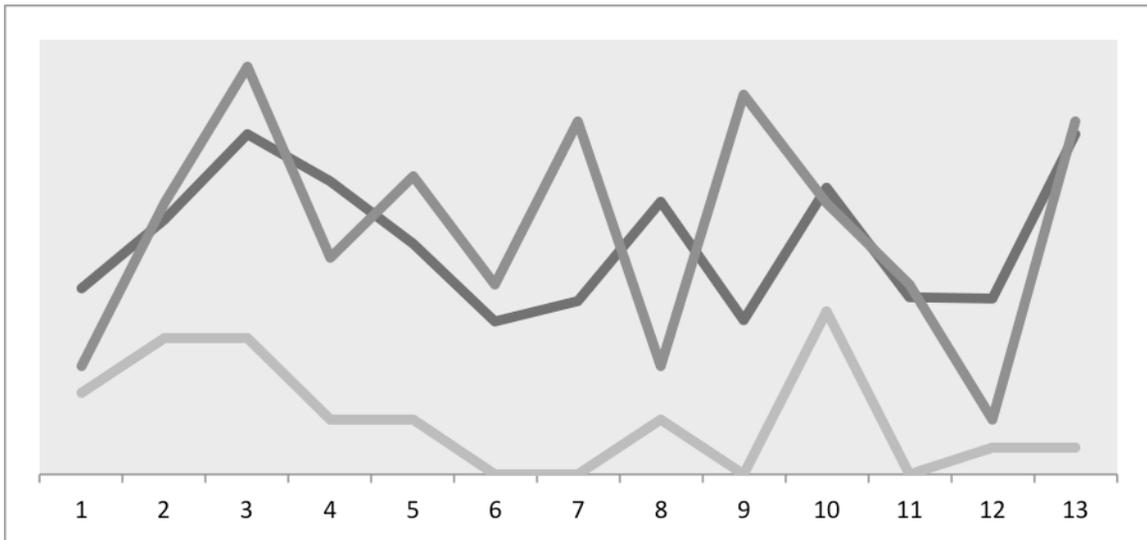
Figure 2 - Scaled DVs and IVs for Issue of Mortgage & Housing Crisis



\* Dark Grey = tweets on Twitter; Medium Grey = Newspaper Coverage; Television Coverage

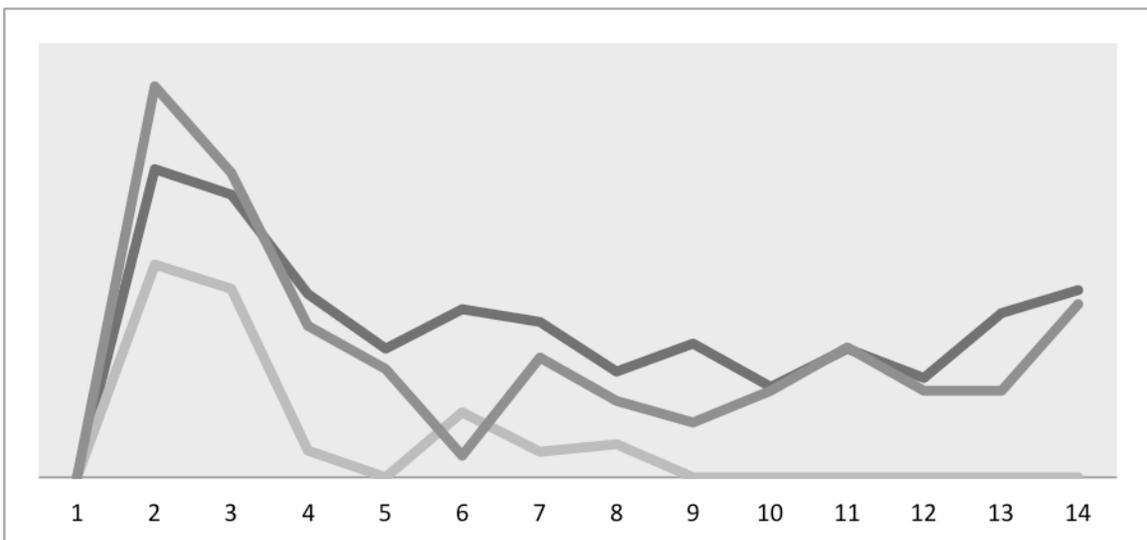
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Figure 3 – Weekly DVs and IVs for Event of BP Oil Spill



\* Dark Grey = Tweets on Twitter; Medium Grey = Newspaper Coverage; Light Grey = Television Coverage

Figure 4 – Weekly DVs and IVs for Issue of Mortgage and Housing Crisis by Week



\* Dark Grey = tweets on Twitter; Medium Grey = Newspaper Coverage; Light Grey = Television Coverage

**Tables**

Table 1 – Twitter Demographics

Gender		Race				
Men	Women	White	Black	Hispanic		
18%	17%	14%	27%	28%		
Age						
18-29	30-49	50-64	65+			
30%	17%	13%	5%			
Education						
< HS	> HS	Some College	College +			
16%	15%	20%	19%			
Household Income				Urbanity		
> \$29k	\$30k - 49k	\$50k - \$74k	\$75k +	Urban	Suburban	Rural
15%	16%	20%	22%	21%	18%	11%

Source: Pew Research Center's Internet & American Life Project Spring Tracking Survey, April 17 - May 19, 2013. N = 1,895 adult internet users 18+.

Table 2 - Bivariate Correlations – All Independent Variables & Dependent Variables

	BP tweets	Mortgage & Housing Crisis tweets
TV # of Seconds	.265*	.514**
TV # of Stories	.337**	.575**
Newspaper # of Stories	.374**	.460**
Newspaper # of Words	.208*	.395**

\*\* . Correlation is significant at the .05 level (2-tailed).

\* . Correlation is significant at the .01 level (2-tailed).

Table 3 - ARIMA Model for Issue of BP Oil Spill

			Estimate	SE	t	Sig.
(DV) # tweets	Constant		6.783	0.086	79.001	.000*
	AR	Lag 1	0.3	0.11	2.717	.008*
	MA	Lag 7	-0.45	0.114	-3.931	.000*
(IV) TV # Stories	Numerator	Lag 0	0.278	0.048	5.813	.000*
		Lag 1	-0.117	0.046	-2.538	.013*
(IV) NP # Stories	Numerator	Lag 0	0.073	0.024	3.049	.003*

$R^2 = .486$ ; Ljung-Box  $Q = 14.482$ ,  $df = 16$ ,  $p = .563$

\*. Correlation is significant at the .05 level.

Table 4 - ARIMA Model for Issue of Mortgage & Housing Crisis

			Estimate	SE	t	Sig.
M&H tweets	Difference		1			
	MA	Lag 1	0.677	0.13	5.207	.000*
		Lag 14	-0.346	0.121	-2.867	.005*
M&H TV # of Seconds	Numerator	Lag 0	0.216	0.089	2.421	.018*
	Difference		1			
M&H Newspaper # of Stories	Delay		1			
	Numerator	Lag 0	9.606	4.093	2.347	.021*
	Difference		1			

Note  $R^2 = .749$ ; Ljung Box  $Q = 17.099$ ,  $df = 16$ ,  $p = .379$ , Outliers = 4

\*. Correlation is significant at the .05 level.

Table 5 - OLS Regression for Alternative Hypothesis – DVs as IVs and IVs as DVs

	BP tweets	BP tweets IV	M&H tweets	M&H tweets IV
TV # of Seconds	1.737*	2.224	1.549*	1.723
TV # of Stories	1.761*	2.143	1.751	1.681*
Newspaper # of Stories	1.622*	2.286	1.777*	1.836
Newspaper # of Words	1.488*	2.043	1.604*	2.044

DW values closer to one are denoted with an \*.