A preliminary evaluation of the impact of unsolicited commercial email promoting stocks on the price of the stock

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Abstract
This article reports on a study in which data on the number of unsolicited commercial emails (spam) promoting the purchase of the stocks of specific companies was compared to changes in the stock’s price in several ways. Spam created a short-term rise in the price of the average stock in the form of a short, damped oscillation, followed by significant downturn several days later. Models of message transmission strategies based on the frequency of sending isolated two possible marginally successful strategies.

Key words
media effects • spam • stock market • unsolicited commercial email

Unsolicited commercial email, better known as spam, is one of the banes of the internet. Employers complain about the amount of time that employees take to process their daily ration of spam and forward-looking thinkers predict the coming of the day where the internet itself will fall victim to ‘the tragedy of the commons’, that is, the common but sad occurrence that a small set of people will completely consume a free resource intended for all people, rendering it useless to everyone (Kraut et al., 2005). Li (2006) also points out a compendium of threats that spam creates for
recipients, including losses of privacy and property rights and offenses against public morals.

Proposals for coping with spam are frequent. Three commonly proposed solutions include anti-spam laws and regulations, per-unit taxation on email transmissions and filtering software. Yet the first routinely falls foul of First Amendment considerations (Sipior et al., 2004), and the second encounters resistance from users who have legitimate business reasons to transmit large numbers of emails (including legitimate businesses engaging in direct email marketing to users who have given their permission to receive messages from their business; Kraut et al., 2005). Anti-spam software is written, marketed and routinely deployed, but whatever algorithms it uses to determine which emails constitute legitimate business and which are spam can be defeated once they are determined.1

In all of this it is asked rarely whether spam actually has any effect on the audience apart from the time that it consumes to evaluate and delete it. A primary reason that this question is asked rarely is that the only people who have access to hard data on the behavioral consequences of unsolicited commercial emails are the marketers who use them. In many cases they are engaged in activities of questionable legal or moral value: for example, the selling of prescription-only medicines with no assurance that the buyer possesses a legitimate prescription or, worse, selling what amounts to patent medicines and worthless ‘guaranteed’ cures. In other cases, even marketers selling legitimate products have a vested interest in claiming that their sales programs are effective. Some of them are essentially in the business of marketing per se and would be unable to sell their services if it were known that spam was an ineffective marketing tool. Others do make legitimate money in what might be termed secondary markets, for example, the development and sale of direct email marketing software or mailing lists to people or companies who are operating in the belief that unsolicited commercial email is an effective sales technique (St Sauver, 2003). None of these groups is likely to consent to formal evaluation of the efficacy of the technique, for if it is shown to be ineffective their businesses are, in essence, ruined.

THE ECONOMIC LOGIC OF SPAM
From the social scientific perspective, the logic of bothering people with spam appears tenuous at best. A spam message generally consists of a brief message of clearly persuasive intent and a link to an external website. While some messages are relatively sophisticated and include graphical materials, others are simply text and often contain numerous spelling and grammatical errors. The source credibility engendered by such messages is of necessity negligible and many people report deleting such messages immediately without reading them.

Additionally, spam campaigns often violate accepted rules of creating effective direct email campaigns. They make no attempt to limit their
marketing to interested recipients or market segments (Peppers and Rogers, 1997), have poorly-written or uninformative message subject lines or bodies and routinely neglect to provide the means for recipients to remove themselves from the mailing list (Mass Mail Software, 2004).

On the other hand, Bauer (1964) is among those who have pointed out that a small effect from the standpoint of the statistical effect size engendered by a persuasive message can be fairly substantial from the standpoint of a marketer attempting to make a profit. Economic analyses which take into account the extremely low cost of creating and disseminating unsolicited commercial email show that financial break-even points for spam campaigns require extremely low response rates. For example, Gopal et al. (2001) have calculated that response rates of 0.5 percent would be profitable in marketing products that would yield only $1 profit per sale.

More typically, spammers often seek larger scores. ‘Xemion-ga’ (a screen name) calculated that a response rate of only 0.02 percent would yield an acceptable profit when marketing a product carrying a $50 per-transaction profit (Google, 2002). Although Xemion-ga made no suggestions of the sort of product that would yield profits of that magnitude, what is important is that this represents the mental set of the spammer. Osterman (2006) reported on a study conducted by CiberTrust, which indicated that links in spam emails generated click-through rates of roughly that order of magnitude (0.0075% of advertisements for Rolex watches yielded click-throughs as opposed to 0.02% of spams for pharmaceuticals). The study was unable to estimate the proportion of actual sales that resulted from these click-throughs; however, only a small proportion of successes is needed, and it appears possible from the scant data presented that successes in that order of magnitude may occur. (It should be noted that CiberTrust sells anti-spam software and thus has a vested interest in the results of its own study.)

EVALUATING THE IMPACT OF SPAM

As previously noted, few spammers are likely to cooperate actively with formal scientific examinations of the effects of spam. Generally, the types of products which could be sold in bulk numbers and would yield $50 profit per transaction are not legal. For example, Food and Drug Administration Associate Director William Hubbard (2003) cited nine cases of people or businesses convicted of selling prescription drugs over the internet without prescriptions between 2001 and 2003; under those conditions the suppliers could charge what they wanted and in return supply not the prescription drugs but sugar pills or other placebos if they so chose. Other products that might bring in such profits would be ‘knock-offs’ of brand-name merchandise (involving trademark violations) or illegally copied software (copyright violations). Also, Osterman (2006) pegs the typical sale of pornography on the internet at $20 per item, in roughly the same financial ballpark.
Additionally, there is the phenomenon of ‘phishing’: attempting to dupe users into giving personal information so that the spammer can engage subsequently in identity theft. Obviously few ‘phishers’, engaged as they are in activity that is literally felonious, will admit to anyone how effective that activity is.

However, interest in identity theft has generated data which suggests one methodology for estimating the impact of spam. First, the Council of Better Business Bureaus (2006) estimates that about 9.3 million cases of identity theft occurred in the United States in 2005. Surveys of victims indicate that about three percent (or about 280,000 cases) were a consequence of internet phishing spam. Currently, about four percent of spam emails received by the author are clearly identifiable phishing attempts, a total of 77 emails in a three-month period or close to 230 per year. Assuming mailing lists of the magnitude of 100,000 addresses (per ‘Xemion-ga’; Google, 2002), there would be about 23 million phishing spam emails generated annually, suggesting a success rate of about 1.2 percent.

However, the number of assumptions underlying the previous calculation point to the difficulty in attempting to evaluate the impact of spam in this manner. Key assumptions underlying the calculation include the following:

1. Is the author’s account representative?
2. Have all phishing attempts been correctly identified?
3. How large are the actual mailing lists in use?

Answering any or all of these questions is problematic and beyond the scope of this article, but it must be noted that the magnitude of the answers could affect materially the estimated success rate.

One type of spammer attempts to profit indirectly rather than directly from sending email, suggesting a methodology that yields the possibility of accurate measurement eventually. The stock market world has long been aware of a process called ‘pumping and dumping’, in which an actor of some kind quietly and slowly amasses a reasonably-sized position of stock in a small company with a low share price, often no higher than mere pennies (hence, ‘penny stocks’). The actor then launches some form of promotional campaign designed to create an interest in the stock among the buying public (‘pump’). Based on the laws of supply and demand, as interest in the stock creates demand for shares, the price increases as a consequence of the demand created and the actor can sell their shares of the stock at the inflated price (‘dump’), realizing a profit that can be substantial. This is considered to be a practice of questionable morality because the increase in the stock’s price is not an actual reflection of its value – and when the demand ceases, the stock price returns to its previous (low) value, costing unsuspecting buyers a substantial proportion of their investments. This is considered by some to be illegal (although the actualities are less clear) and by most to be unscrupulous (Gardner and Gardner, 1998).
It should be noted that a New York-based email spammer has been imprisoned for promoting stocks with false information, which of course would constitute fraud (Smilon, 2003). However, based on the author’s experience, there are email spammers who often present accurate information gathered from a company’s own press releases, which is clearly not fraud. Others make the simple claim that there is a massive PR campaign underway – which there is, because the spammer is conducting it – also avoiding any implication of fraud. For example, an unsolicited commercial email for AbsoluteSKY, a retail security firm, included the text of the company’s press release concerning a merger with another company, while spam touting Falcon Energy, a Canadian natural gas supplier, proclaimed: ‘There is a big PR campaign, starting today and running the week’.

Other strategies include sending what the Security and Exchange Commission describes as ‘forward-looking statements’, or predictions that the stock price will increase. For Cantex Energy: ‘Check the stock ready to explode: CTXE.PK. CURRENT PRICE: $0.55 Expected price at the end of the week: $1.0!’ [sic]. Another strategy is the ‘intercepted tip’: ‘Hi, Sherrie, hope I hit your correct email address . . . [touts American Unity Investments] . . . I hope it was a helper [sic]. I’ll email you later this week. Andrea’.

To the recipient, these types of unsolicited commercial emails differ from offers of pharmaceuticals or watches in that they involve third-party transactions. One does not buy the stock from the spammer or even click on any link contained in the email. Instead, one deals with a licensed stockbroker of some kind. Spams for stock tips often defeat spam blocking software because the textual cues that characterize them also might be characteristic of legitimate business information, unlike terms such as ‘Cialis’ or ‘Tiffany purse’, which might arise in personal communications but rarely in legitimate business communications.

For scientific purposes, the pumping of stocks differs from the sales of pharmaceuticals or knock-off watches in that it is intended to create a measurable impact in the external world: that is, in the price of the stock being pumped. Therefore, it should be possible to discern the impact of spam emails touting specific stocks in the price of those stocks, if there is one.

Two different sets of researchers, Bohme and Holz (2006) and Frieder and Zittrain (2006), each attempted to examine the efficacy of spam emails touting stocks from an econometric standpoint. Each group found significant impacts on sales volumes for the stocks touted that day as well as modest but significant price gains. Frieder and Zittrain (2006) also report modest gains in price on the day preceding the arrival of stock spams.

In each of these studies messages were treated as individual events. However, in treating messages as individual events, they neglect the concept...
of a message transmission ‘strategy’ wherein an actor uses multiple messages across time to maximize the impact of the message set as a whole. Of course, messages can be sent according to any timing pattern and in any number desirable to the sender. Use of a message transmission strategy automates decision processes for the spammer: stock prices are volatile (and must be, to be pumped and dumped) and the alternative to a strategy on selling is guessing.

RESEARCH QUESTIONS
The fundamental research question to be explored herein is: ‘Is unsolicited commercial email capable of invoking substantive behavioral responses in recipients?’ In this particular instance, we wish to examine whether there is an association between the transmission of spam emails touting a specific stock and subsequent increases in the price of that stock.

A fundamental and basic expectation is that the price of the stock promoted in an unsolicited commercial email will increase following transmission and receipt of the spam message. This will need to be explored across a number of timeframes, ranging from intraday to months, as the nature of the process suggests a certain degree of latency. In principle, people should not buy stocks before checking them out. Buyers are routinely warned to do so (even in some of the spam messages themselves) and it can take an indefinite amount of time. Even simple mechanics suggests a certain amount of latency: most people do not read emails the instant they receive them.

Beyond this basic expectation, it should be clear that there are innumerable theoretical positions suggesting that messages, even poorly constructed, unsolicited messages from sources of questionable credibility and motivation, can generate effect sizes of the magnitudes discussed earlier (that is, 0.0075% to 1%). Even the evidence discrediting direct effects models (Klapper, 1960) allow for the possibility that in a large population it is possible to find a subset, proportionately small but in this case numerically substantive, that will respond.

A secondary research question is: ‘Is there an optimal message transmission strategy for unsolicited commercial email?’ Spammers who engage in the promotion of stocks in order to engender subsequent rises in their prices do so for the purpose of making money, to put it baldly. If these actors possessed perfect knowledge of the market, they could sell their stocks when they are at their peak prices, thereby maximizing profits or, at minimum, minimizing losses. However, the fact that a stock’s price has peaked is only known ex post facto, that is, after it has started to decline, which is why reliable analysts try to avoid discussions of profits realized by selling at peaks.6 In the absence of perfect knowledge, actors must engage in strategies designed to optimize their long-term outcomes. Fortunately, it should be possible to model these strategies to see if any are efficacious. Possible strategies focusing, as above,
on the number of messages transmitted across the duration of a campaign could include the following:

- **Immediate effect model** – the actor sends a single message, assuming that recipients respond immediately (which is to say, within a period of a small number of hours). The actor sells at the end of this window, takes a profit, if any, and ceases transmission. Space Propulsion Systems, China World Trade and Sportsstuff.com are among the companies promoted by exactly one email across the course of this study;

- **Linear aggregation model** – the actor sends a number of messages across a period of time. Recipients slowly notice these messages standing out from other spam and legitimate messages over a period of time, perhaps as long as days or weeks. After a number of weeks the actor takes their profits, if any, and ends the campaign. For example, the author received 32 emails about Goldmark Industries across a 68-day period during 2006, 19 in 27 days touting Forest Resources Management and 13 in 69 days for KMA Global Solutions; and

- **Buzz** – the actor floods email boxes with a burst of messages across a very short time period, the messages ideally being constructed to appear to come from a number of different sources, creating interest in the recipient that has a snowball effect, leading to a peak stock price inside of a period of only a few days. The actor sells and moves on. For example, three spams for Bicoastal Communications arrived on 19 September, five for American Unity Investments on 18 September and six for Biogenetics Ltd, on 21 May. No other emails about any of these stocks were received between 8 May and 14 November.

**Method**

Beginning on 8 May 2006 and continuing to 14 November 2006, all unsolicited commercial emails promoting specific stocks sent to the author were recorded and saved. Included with each of the messages was the date stamp indicating when it arrived. In total, the author received 784 emails representing 98 promotional campaigns. The number of spams per campaign ranged from one to 56 (for L International, a Chinese computer manufacturing company). This represents approximately 20 percent of the spams received by the author in this time period, indicating both the magnitude of the stock touting business and also the magnitude of the spam problem.

The 98 campaigns were then subjected to two sorts of analysis, one long-term and one short-term. The long-term analysis involved recording the stock’s price at specific intervals in the future while the short-term analysis recorded the stock’s price for a period of 19 business days, including five days...
before the first receipt of a spam about the company. Each of these will be discussed in turn.

**Long-term analysis**

For the long-term analysis, the date and time of receipt of the first email promoting a specific stock was recorded. Based on the open trading session of the New York Stock Exchange (9:30am to 4:30pm weekdays, excluding holidays), the first trading day in which the stock could be purchased following receipt of the first message was designated ‘Day 0’ and the starting price of the stock that day recorded.

The starting price of the stock was also recorded at subsequent intervals of one, four and 12 weeks after Day 0. (‘Week 1’, ‘Week 4’ and ‘Week 12’ respectively.) The time periods one week, four weeks (month) and 12 weeks (quarter) were selected *a priori* based on informal observations of stock spam emails received before the onset of this project. As stated above, some campaigns only generated a single email. The longest duration was for Petrosun Drilling, lasting from 29 July to 19 October, a total of 77 days, so even it was completed inside of 12 weeks.

Also recorded at the same time were the starting prices of two important indicators of the overall health of the stock markets as wholes: the Dow Jones Industrial Average, which summarizes the activity of 30 stocks selected by Dow and Jones as representing the US economy as a whole and the NASDAQ composite index, which represents activity on the NASDAQ market of new and technologically-based stocks. The comparison of recorded prices of the stocks being touted to the Dow and NASDAQ indices will permit some control of changes in the touted stock’s performance which could be attributed to the overall health of the markets.

For the purposes of aggregating data, all stock and index prices were transformed to proportionate growth (∆%) terms as compared to the Day 0 starting price of the item (stock, Dow or NASDAQ) being measured. This allows aggregation of stock activities without creating an ad hoc weighting of stocks by price. This is to be desired since the prices vary widely from stock to stock, ranging from a Day 0 start of $7.05 per share (Kingslake Energy) to 0.33 cents per share for Amerossi International. Of the 98 stocks in the long-term study, 75 started at prices of under $1 on Day 0, with only two at under one cent.

Also recorded was the number of stocks that were up (‘winners’), down (‘losers’) or remained the same in price (‘even’) across the time interval being examined. Similar data was recorded for the Dow and NASDAQ indexes, except, of course, the data represents whether the index was up or down across a given time interval. This reduces change data to an ordinal form, but market reporters routinely report the numbers of winners and losers as a crude but obvious indicator of the health of a market.
In order to examine the final research question, two additional pieces of information were recorded for each stock: the number of emails received about the stock and the length of the time interval (in days) between the receipt of the first and last messages about a given stock.

**Short-term analysis**

For the short-term analysis, it was important to recognize the manner in which stocks are sold. Sales brokers and purchasers negotiate, looking to get the highest and lowest price that they can, respectively. From a practical standpoint, what this means is that the price of a stock can change in essence even when it is not being traded actively in that news that arrives or becomes public after the trading day (known as ‘after hours’) can be reflected in the starting offer price the next day. If there is good news after hours, sellers reasonably can be expected to start the next day’s offering at higher prices than they closed at the evening before and, conversely, the price can open lower if the after-hours news has been bad. It is for this reason that many companies report news such as profits or losses immediately after the close of trading on a given day: the market will have the entire after hours period to digest the information.

In order to reflect this reality adequately, for the purposes of short-term analysis each business day was divided into segments termed ‘epochs’. The day epoch lasts the length of the trading day, again, typically 9.30am to 4.30pm, although the trading day is sometimes shortened on the eves of important holidays. Activity on the day epoch can be represented simply as the difference between the stock’s price at the day’s opening and its price at the closing. The after-hours epoch starts at the close of the market on one trading day and ends at the start of trading on the next, a period which can last from 17 to 89 hours depending on whether the next day is an adjacent day, a Monday following a Friday close, or the Tuesday after a three-day weekend. Activity during the after-hours epoch can be represented by examining the difference between the closing price of the stock on one day and the opening price on the next.

Data was isolated for a total of 116 separate campaigns promoting the stocks examined in this study. For the purposes of this study, if spam activity for a given stock was dormant for several weeks, the onset of a new campaign was counted as a separate event. Data was unrecoverable for three of the stocks that were part of the long-term study. For the others, price activity was determined for five business days (10 epochs) before and 14 business days (28 epochs) after the first receipt of a spam stock tip about that stock. Price information was transformed, as above, to the proportionate change in price across the epoch and recorded for all 38 epochs under examination.

The epochly-based series of proportional changes for the 116 campaigns were coordinated, as implied above, so that the arrival of the first email received about the stock coincided with the 11th epoch, regardless of
whether it was a day epoch or an after-hours epoch, and the changes summed across all companies for each of the 38 epochs. The price data was plotted against epoch and the means tested to see if they differed significantly from zero. Dow and NASDAQ data was not used in the short-term analysis.

RESULTS

In considering the results obtained, first the long-term analysis then the short-term will be examined. Finally, the efficacy of the three-spam message transmission strategy models in predicting change in stock price from known information about spam transmissions will be tested.

Long-term analysis

As stated previously, the starting price of promoted stocks was recorded at specific intervals: one, four and 12 weeks. The results were transformed to a percentage change from the starting price of the stock on the last business day before receipt of the first spam about that stock. The aggregated data are reported in Table 1, along with the numbers of ‘winners’ and ‘losers’ across that time period for the promoted stocks, the Dow Jones Industrial Average and the NASDAQ index. It must be noted that one stock had to be eliminated from the analysis due to irregularities in its pricing information.

As can be seen on Table 1, by week 1 the sign of the Δ% is negative (indicating that prices are below where they started on Day 0) and the difference is significant (t(95) = −1.66, p < .05). By the end of four weeks the promoted stocks had lost almost 30 percent of the value they had at the onset of the promotional campaign, and more than half their value at the end of 12 weeks. These results are both substantive and significant (t(95) = 9.30, p < .01 for four weeks; t(92) = 14.79, p < .01 for 12).

<table>
<thead>
<tr>
<th>TIME LAG</th>
<th>MEAN Δ%</th>
<th>s</th>
<th>WINNERS</th>
<th>LOSERS</th>
<th>EVEN</th>
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<tr>
<td>1 week</td>
<td></td>
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<td></td>
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<tr>
<td>Spammed stocks</td>
<td>−5.58*</td>
<td>33.34</td>
<td>30</td>
<td>58</td>
<td>10</td>
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<tr>
<td>Dow</td>
<td></td>
<td>65</td>
<td>33</td>
<td>0</td>
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<tr>
<td>NASDAQ</td>
<td></td>
<td>59</td>
<td>39</td>
<td>0</td>
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<td>4 weeks</td>
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<tr>
<td>Spammed stocks</td>
<td>−28.89*</td>
<td>30.76</td>
<td>13</td>
<td>81</td>
<td>4</td>
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<tr>
<td>Dow</td>
<td></td>
<td>81</td>
<td>17</td>
<td>0</td>
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<tr>
<td>NASDAQ</td>
<td></td>
<td>67</td>
<td>31</td>
<td>0</td>
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<td>12 weeks</td>
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<tr>
<td>Spammed stocks</td>
<td>−51.74*</td>
<td>34.09</td>
<td>5</td>
<td>88</td>
<td>2</td>
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<tr>
<td>Dow</td>
<td></td>
<td>90</td>
<td>4</td>
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<td>NASDAQ</td>
<td></td>
<td>81</td>
<td>14</td>
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* = p < .05.
It should be noted that these stocks are not necessarily declining because they are generally bad investments. Prices were recovered for 76 of the entries for a point one month before the beginning of this study and compared to their price at the start. One month before the study the stocks were selling for only seven percent more than at the beginning, a statistically insignificant amount ($SE = 6.995$, $t = 1.03$). Basically, these stocks remained stable in price in the month before the onset of spam campaigns for them and their prices plummeted afterwards.

It should be noted also that these losses are incurred during a time period when the markets as a whole were rising. This can be seen by comparing the proportions of ‘winners’ and ‘losers’ in the touted stocks to those of the Dow Jones and NASDAQ indices (as also listed in Table 1). The Dow, for example, significantly outperformed the touted stocks in each of the time intervals ($\chi^2(2) = 20.84$, 60.74 and 57.04 for one week, four weeks and 12 weeks, respectively, $p < .05$ in each case). In brief, any person using the unsolicited commercial emails for stock purchase advice would have been better served by investing in a mutual fund or stock index pegged to the Dow Jones Industrial Average. They would have gained about six percent on their investment at the end of 12 weeks instead of losing more than half of it. Performance of the touted stocks against the NASDAQ was only slightly better than their performance against the Dow.

**Short-term analysis**

Data for the sort-term analysis was aggregated and is presented as Figure 1.

*Figure 1* Percent change in stock price by epoch

\* = $p < .10$.

\** = $p < .05$.

Starts of message campaigns are aligned to epoch 11.
Only five of the 38 epochs differ significantly from 0 and two more fall in the \(0.05 < p < 0.10\) range in effect size. Epochs 22 and 26 – which represent a time somewhat less than two business weeks after the onset of the spam campaigns – are both significant and negative in sign, indicating substantial sell-offs driving reduction in the stock prices.

More interesting, of course, is that the mean proportional change for epoch 11 is significantly greater than 0 and more than twice the size of the change in any other single epoch. As stated previously, all of the datasets were adjusted in time so that the first spam email about each would fall into the 11th epoch. Therefore, this is a clear indication of an immediate and indeed substantive (more than 11%), increase in mean stock price occurring during the epoch in which a spam campaign starts. Epochs 13 and 15 – parallel epochs for the next two business days – are also both significantly larger than zero and 14 is marginally significant but negative in sign.

This is interesting and clearly supports the basic expectation that the stock price will increase following transmission and receipt of the spam promotions. In fact, the data suggest a short-term, damped oscillation in the stock price followed by a significant downturn.

**Examining models**

The first message transmission model, the immediate effects model, was tested by constructing a \(t\)-test of all the campaigns consisting of a single message against all others across all four time periods, expecting the direct effects model to perform better only on the one-day lag, as the spammers whose campaigns are informed by this model are expected to sell their stocks immediately, driving the price down quickly.

The immediate effects campaigns showed a marginally significant level of efficacy (again, \(p < 0.10\)) on the next day’s price. Campaigns which generated a single email appear to have outperformed all others in the next day. Sending one message and selling the next day may be a useful strategy, as sending a number of messages and selling inside the same epoch also may be. From the standpoints of persuasion or marketing there would have been no reason to expect a single message strategy to have any effect. However, this is exactly the strategy deployed in 36 of the 98 campaigns tracked here.

The second model, based on notions akin to linear aggregation theories, involves a spammer sending out a number of messages across a period of time. This was examined by regressing a dummy variable created by multiplying the number of messages dispatched by the campaign by the duration of the campaign: that is, the number of messages by duration interaction on the proportional price changes for all four time periods. This model had marginally significant \((p < 0.10)\) effects at the end of four weeks. Unfortunately, during that same four-week period, the average stock’s price declined more than 30 percent. Assuming that the linear regression model
assumed holds true, the slope \((b = 0.010)\) implies that it would require 3000 message-days to hold the stock price steady: for example, by sending 100 messages a day for a 30-day period.

The third model, termed ‘buzz’, relies on message density as a strategy. To estimate message density, the number of messages was divided by the number of days of the campaign and the changes in stock price regressed onto this constructed variable. This strategy manifestly proved ineffective across all time periods.

**DISCUSSION**

It is worth noting again that the short-term analysis shows clear and significant evidence that there is an association between the onset of a spam campaign designed to increase the price of a stock and a brief increase in the price of that stock. In short, perceived from the perspective of social science, spam works. This is consistent with the findings of Bohme and Holz (2006) and Frieder and Zittrain (2006). However, we did not observe a price increase in the day before as Frieder and Zittrain did.

Of the message transmission strategies examined, only two demonstrated any impacts of marginal influence on stock prices. It appears that sending a number of messages across a period of time allows a spammer to exert some kind of positive control over the price of a stock; also, that potentially a one-message strategy could be effective. (In each case the results are of marginal significance. We chose to include them due to the preliminary nature of this report, as a device to point out a direction for further research.)

In this preliminary examination, we did not consider the differences in message content strategies. As noted previously, spammers transmit messages that vary widely in professionalism and persuasive technique. Formal content analysis and categorization of content strategies combined with the impact data presented may yield insight into which messages are most effective, allowing us to begin to make inferences about the nature of their target audiences.

At this point it is worth taking time to consider spam as a social phenomenon not simply from the standpoint of the scientist, but also from three other viewpoints. The first is that of the spammer: what is their motivation for inflicting unwanted email on others? The second is that of the spammed: why do people respond to unwanted messages that are frequently poorly constructed from sources of poor or no credibility by doing what these sources want them to do? The third is that of the secondary suppliers of the spam market, the people who sell bulk email software or mailing lists.

**The spammer**

The economic logic of spam is the same logic that underlies any other ‘get rich quick’ scheme: the idea that if one just does certain, easily-done things in...
certain ways, riches shall surely result. And the results we have discussed above suggest that at least part of that equation is true in the case of investors who use unsolicited commercial emails to ‘pump and dump’ little-known stocks. It appears that spam can influence the buying behavior of a percentage of recipients, in turn influencing the price of the stock being touted.

What the data presented here suggests is that even to the extent that spam is effective, the returns are such that it cannot be an effective get-rich-quick scheme. The average percent increase for a touted stock in the epoch in which a campaign started was 11.3 percent. Of the 116 stocks in the short-term analysis, 19 made no gain at all and 19 more actually lost money during the transmission epoch. Only four stocks yielded the kinds of gains that spammers dream of – they doubled during the epoch during which emails were first sent about them. One of them, Cyberhand Technologies, had returned to its original price by the end of the next day, all gains negated if the spammer had not sold at exactly the right moment.

To realize these profits, spammers would have had to quietly lay in an amount of Cyberhand’s stock without previously driving the price up. Also, they would have needed to pay brokerage fees, which could be substantial for a broker allowing subscribers to make after-hours transactions. Additionally, there would be liability for short-term capital gains taxes, which are taxed as ordinary income.

In short, it is possible to make money via the process of transmitting unsolicited commercial email, but to do so would require the same sort of work and effort as any other form of day trading of stocks. It would require a substantial capital investment in a number of stocks accumulated slowly over a period of time and would run the risk of falling afoul of fraud charges, depending on the nature of the promises made in the email.

The spammee

A key question in the process of evaluating the effectiveness of spam in creating behavioral outcomes is the motivation of the recipient. As pointed out several times previously, spam emails arrive from unknown sources and are by definition unsolicited. They recommend that the recipients invest in specific stocks of which they probably have never heard. Oftentimes they are stocks of companies that sound trendy, companies doing business in China, or in the energy, space or health care sectors. The ideal audience for the spammer is an investor experienced and sophisticated enough to have their own investment account and/or broker.

It is hard to believe that an investor of that level of sophistication would find this message (received 29 October) convincing:

The accumulation of positions by those in the know has shot A_U_N_I up 33% in a few short days. We hope you all got in early like we told you to and are enjoying good fortune. But even if you didn’t don’t worry because the big
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announcement has yet to be made. Monday, October 30 may be your last chance before this thing triples. Don't hesitate.9

AUNI had not risen 33 percent at any point during the previous year. It is likely not to have been tripling because there was no underlying financial reason for it to do so. In addition, purchases by ‘those in the know’, i.e. insiders, are routinely reported to the Securities and Exchange Commission (SEC) as a matter of federal law and can be checked. Yet investors apparently do buy based on such statements. Future research examining the motives and reasoning of recipients may be key to understanding the phenomenon.

Secondary suppliers
Secondary suppliers, that is, people who manufacture, compile and/or sell the software and mailing lists that are used in the spam process, are the only guaranteed winners in the game. Returning to the example of ‘Xemion-ga’, who wanted a return of 0.02 percent on his product carrying a $50 profit, his key expense was $300 to purchase a mailing list.

Once a person has compiled a mailing list, it is an almost perfect product. There need not be any physical storage, no overheads, no other costs whatsoever except as much or as little advertising as the person would like to do. It can be sold to as many people as will buy it, and unlike many of the products touted by spams, it is a product that is not illegal to sell and requires no prescription.

In consequence, the group of people with a vested interest in promoting the efficacy of spam is not spammers, it is the secondary suppliers (St Sauver, 2003).

CONCLUSION
It is not an accident that the three research studies attempting to evaluate the impact of spam have focused specifically on stock tout spams. Of all the various types of spam, they are the only ones whose impacts can be examined external to the proprietary data gathered by spammers themselves.

At the same time, they are atypical of spam as a whole. They appeal only to a very specific audience, investors. They do not include a link to be clicked and require the recipient to take action independent of the spammer or the spammer’s own investment business. Unlike much spam, because of the business-oriented nature of the content, they are blocked less frequently by anti-spam software. Those forces tend to offset one another to a degree, but it is unlikely that they completely balance.

Stock tout spams have a significant effect on the price of the stock, clearly implying that they have a direct influence on the behavior of some of their recipients. Given the nature of the factors causing stock spam to differ from other spam, it seems likely that spam for products appealing to a greater segment of the audience, say, for Accutrim, a diet drug – which permits the recipient to take direct action simply by clicking the mouse – could potentially engender larger audience responses. It falls to us to devise
additional methodologies to measure those responses, both for the scientific value of the data gained, and because it may prove critical to policymaking in the future.

Notes
1. For example, anti-spam software can be set to label an email containing the words ‘Viagra’ or ‘Accutrim’ as spam. Spammers routinely defeat this by spelling the words as ‘Vlagra’ or ‘Accu’trim’. It is the author's experience that software sufficiently rigid to exclude these also routinely excludes legitimate email, to the detriment of both user and sender.

2. ‘E. Frey’ (2CdnmXDb2n@mail.ru), ‘of BRAD a money Considered KENNETH’, email to author, 31 May 2006.


4. ‘Molly’ (margerybo7x@hotmail.com), ‘overwhelmingly important message C T X E get straight to earning’, email to author, 2 June 2006.

5. ‘L. Hilliard’ (akstcaardenellemdgs@aardenelle.com), ‘Fw:’, email to author, 19 October 2006. It must be noted that the author's name is not Sherrie. Also, please note that in this article, names enclosed within quote marks are pseudonyms.

6. In short, one cannot sell at a peak because at the time, one does not know that it is a peak. One does not know that the peak was a peak until the price has fallen again.

7. Eight of the campaigns were for stocks which had been promoted previously. If there had been little or no promotional action on a stock for a period of two months or longer, subsequent mailings were deemed to constitute a new campaign.

8. Because many of these companies are small and obscure, there is little interest in their trading patterns. It is not uncommon for some of them to go entire days during which not one share of their stock is sold. As a result, there is little demand for their sales histories. Unfortunately, it was not possible to record sales information for stocks before they were called to our attention by receipt of the spams touting them, so there was a number of missing cases.

9. ‘D. Spicer’ (yclyoer@angelashomepage.com), ‘Please confirm your signup’, email to author, 29 October 2006.

References


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