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   RESULTS & DISCUSSION

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THE EFFECTS OF THE STOCKS PERFORMANCE RELATIVE TO THE INDEX PERFORMANCE, ON TRADERS' BEHAVIOR IN NYSE

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ABSTRACT

This study investigates the correlation of the relative status of a stock in respect to the whole market, i.e. whether a stock has under or outperformed the index in a period of time. Indeed we have proposed a model which considers the relative performance of each stock as a signal to buy or sell the stock. The model parameters have been computed for components of 3 indexes: S&P100, Dow Jones Industrial Average, and PHLX gold/silver sector. Historical data ranges as far as available in our database until June 2011. We observe that, most of the time, this correlation is negative and there is a negative feedback in trading behavior of traders. Next we investigate the effect of considering volume of trading in each day on this correlation, by using volume weighted least square method. We observe that the correlation is more notable when we consider volume of trading. Also we investigate the asymmetry of traders' behavior in response to positive relative status _good news_ and negative relative status_ Bad news. The result shows that the negative feedback in traders' behavior is weaker when a stock has underperformed the whole market i.e. has a negative relative status. Also we categorize the stocks in each index into different categories according to their capital markets and other characteristics, and then we investigate the correlation and asymmetry factor for each category.

KEYWORDS
index performance, GARCH model, trader behavior.

I- INTRODUCTION

There is a large amount of research about investigating the behavior of traders in financial markets. One of the key important issues in this field is how individual traders choose strategies for trading[1]. How do they decide which stock to buy or sell? Various strategies result from using different source of information to answer this question.

Two major strategies are discussed in this context, Positive feedback trading and Negative feedback trading or contrarian trading, which both look into the past performance of the stocks. The former includes those investors who sell losing stocks and buy winning stocks in the past. The later includes those who act the opposite way, i.e. buy the losing stocks and sell the winning ones. Ron Kaniel [1] reports that individuals tend to buy stocks after they fall, and sell stocks after they rise in price. He explains that contrarian investors act as liquidity providers for immediate needs of institutions. Institutions' needs to liquidity lead them to bid higher and ask lower than the actual price, which results in contrarians traders' profit. Griffin [2] investigates the relation between return and trading behavior of individual and institutions for components of NASDAQ and reports that stocks which have performed well in short past are more likely to be bought by institutional and sold by individuals. T. Odean [3] studies traders' tendency to sell winning stocks and buy losing ones. M.Barber hypothesize that many investors only consider buying stocks which attracts their attention. In other words they buy stocks which seem "hot" in the market.

Goetzmann and M.Massa [3] investigates individual accounts of index mutual funds to examine the trading behavior of individuals; specifically it's relation to stocks returns. He report that more frequent traders are negative-feedback investors and less frequent traders are positives-feedback ones. He also notes that the behavior of positive-feedback is more correlated to the changes of S&P500 than the behavior of negative feedback traders is. Barberis, Shleifer and Vishny (1998), Daniel, Hirshleifer and Subrahmanyam (1998) and Hong and Stein (1999) each proposed models of investors' behavior which may lead to both contrarian and momentum trading, and affects the asset prices. Hirshleifer, Subrahmanyam, and Titman (1994), and Grossman (1995) respectively claim information asymmetry and incomplete markets as a reason of traders' tendency to have portfolios which are conditional on the past performance of the stocks.

[1] 1-,Yan-Leung Cheunga, Yin-Wong Cheungb, , Angela W.W. Hec, and Alan T.K. Wand, (2010), Feng Wang, Keren Dong and Xiaotie Deng(2010), ,Richard D.F. Harrisa, Fatih Yilmazb(2009),Sheng-Tun Lia, b, and Shu-Ching Kuob,(2008),Anna Obizhaeva and Jiang Wang_(2006),Chris Brooks, Alistair G. Rew, Stuart Ritson(2001) ,Pen-Yang Liao; Jiah-Shing Chen(2001), Peter Lakner*(1998), John.Macconnel & Gray C sanger(1984)

Our work lays in the literature of past performance conditional strategies. But unlike most studies, we have proposed a model which considers the relative performance of each stock as a signal to buy or sell. Our approach is more close to Goetzmann in the sense that we use index performance and compare it with stocks' performance as a status indicator. We have studied the whole effects of institutional and individual traders on the asset price. So in our first phase of research_ this paper _we have not distinguished institutional traders and individual traders.

Put it in a nutshell, if an stock return with comparison to a reference time is more (less) than the corresponding value for the index, we can say that the stock has out(under)performed the index .i.e. average of the whole market. In other words we expect that the return of the stock is modified with J_ the relative states factor_ times relative status with respect to a reference time, i.e. $(\frac{S_t}{S_o} - \frac{I_t}{I_o})$. Details about the computation of J and the model, is presented in section II. We expect negative J, so the overall trading of the market stabilizes the price. Although there are evidence of positive J in some cases, but the average value of J for all the stocks considered is negative.

Another issue worth considering is the asymmetric response of traders to "relative status of a stock" with respect to the market. In other words we expect that people response asymmetrically to good news and bad news. Thomas C. Chiang, Cathy W.S. Chen, Mike K.P(2007) study this behavior and find that negative news have stronger (negative) effect on stock returns than good news, which have (positive) effect on returns. Harrison Hong, Terence Lim, and Jeremy C. Stein (1999) claims that analyst coverage is more pronounced for past loser stocks than past winner ones. We have considered this issue in our study by adding the term $\lambda I_{(\frac{S_t}{S_o} - \frac{I_t}{I_o})}$ in our model, which I is the indicator function, λ is called the asymmetric response factor. The sign of the λ shows which response is more significant, when a stock has outperformed or when it has underperformed the market. The evidence shows that λ is negative which shows traders response to negative relative status with respect to market is more significant than positive relative status.

There are several important factors which affects relative status factor, J. Volume of trading is one of them. The effects of volume of trading on asset price have been studied exclusively. Jiang Wang (1994) studies the relation between trading volume and price dynamics. Andrew W. Lo and Jiang Wang (2001) try to develop an economic model of asset prices and volume. Thierry Ané1 and Loredana Ureche-Rangau (2008) examine the relation between trading volume and returns volatility. Considering the studied effect of trading volume on asset price, we have computed J with two approaches. In first approach we compute J as regression factor of daily return on the relative status, $(\frac{S_t}{S_o} - \frac{I_t}{I_o})$, and in the second approach we use a volume weighted least square method to put more emphasize on days which have higher volume of trading. The rationale behind this is that we expect the price of the stock in such days be more reliable and informative than the other days, so we should give more weight to them.

The other parameter is the characteristics of the stock itself, such as capital market representing the size of the company. We have computed J and λ for different size of companies, the results of which are shown in section IV. The rationale for categorizing companies into small, medium and large ones according to their capital market is explained as follows. There is another phenomenon related to our study called herding behavior of investors, which is that individuals and institutions disregard their private information, and herd in buying or selling. Herding is defined as a group of investors following each other into (or out of) the same securities over the same period of time. In this case the source of information is how the other investors behave. This behavior has the potential to occur among institutions as well as individuals. We expected that herding among the investors will strengthen the effect we study, resulting in increase of J. As far as we know, so far the strongest herding observed –for individual or institutional investors- is for small companies[2]. So we expected that small companies will have higher J. and this expectation motivated us into this categorization of assets and computing our model parameters _J and λ _ for each category. The result of this categorization is presented in section IV.

The paper structure is as follows, section II describe the model. Section III describes the methodology and data used. Section IV is dedicated to data analysis. Section V concludes the paper and suggests further research.

II- MODEL

A- **The Symmetric Model** We begin with the conventional model for the dynamics of asset price which is

$$dS_t = \mu S_t dt + \sigma S_t dB_t \tag{1}$$

Where dB_t is $N(0, \sqrt{dt})$. As mentioned before we define relative status of the stock with respect to the whole market as $(\frac{S_t}{S_0} - \frac{I_t}{I_0})$, and expect that J - the relative status factor- times relative status modify Equ (1). We impose this modification by adding the term $J(\frac{S_t}{S_0} - \frac{I_t}{I_0})$ to the drift term of Equ (1). Note than the sign of J has a key role in our analysis about which we have more to discuss in section IV. So we have

$$\frac{dS_t}{S_t} = (\mu + J\left(\frac{S_t}{S_0} - \frac{I_t}{I_0}\right))dt + \sigma dB_t \tag{2}$$

The question is how we can estimate model parameters specially J form available data. First we define $Y_t = \ln(S_t)$ and use Ito's formula to rewrite Equ (2) in the following form

$$dY_t = (\mu - \frac{1}{2}\sigma^2 + J\left(\frac{S_t}{S_0} - \frac{I_t}{I_0}\right))dt + \sigma dB_t \tag{3}$$

Now, transforming Equ (3) into discrete time results in

$$dY_t = Y_{t+1} - Y_t = (\mu - \frac{1}{2}\sigma^2 + J\left(\frac{S_t}{S_0} - \frac{I_t}{I_0}\right)) + \sigma\epsilon_t \tag{4}$$

Where we have assumed $\epsilon_t = dB_t$ is $N(0, \sqrt{dt})$ and $dt = 1$.

Now we can compute J by regressing daily return, i.e. $dY_t = Y_{t+1} - Y_t = \ln\left(\frac{S_{t+1}}{S_t}\right)$ on relative status, i.e. $\left(\frac{S_t}{S_0} - \frac{I_t}{I_0}\right)$.

B- **The Asymmetric Model** Now we modify Equ (4) in order to capture the asymmetric feature of traders' response to positive (negative) relative status. In other words we expect that traders will respond to relative state of a stock price differently, depending on whether it has performed above the index (a hot stock) or under the index (not a hot stock).

This effect is somehow similar to asymmetric GARCH models[3] in which we assume that if the real return of a stock is lower than the expected one then traders will respond to this bad news in a more sever way than when the real return of a stock is higher than the expected return (good news), which in both cases traders respond will result in higher volatility of the return in the future, based on GARCH models. Here we have a similar situation, but not exactly the same one, because in this case traders will respond to the stock relative status with respect to the whole market ,i.e. the sign of relative status, $\left(\frac{S_t}{S_0} - \frac{I_t}{I_0}\right)$, not to the "changes" of the stock price per se. So we can modify Equ (4) in the following form

$$dY_t = Y_{t+1} - Y_t = (\mu - \frac{1}{2}\sigma^2 + J\left(\frac{S_t}{S_0} - \frac{I_t}{I_0}\right) - \lambda J I_{\frac{S_t}{S_0} - \frac{I_t}{I_0}}) + \sigma\epsilon_t \tag{5}$$

Where I_x is the indicator function whose output is 1 for negative x and zero for positive x, And λ is the asymmetry factor.

We have used Maximum-likelihood method to estimate λ. as mentioned earlier $\epsilon_t = dB_t$ is $N(0,1)$ and we make the conventional assumption that ϵ_t s are independent so we could easily write their joint PDF as

$$f(\epsilon_1, \epsilon_2, \epsilon_3, , , \epsilon_N) = \prod_{i=1}^{N} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}\epsilon_i^2} \tag{6}$$

---

[2] Josef Lakonishok, Andrei Shleifer, Robert W. Vishny -1991 found some evidence of institutional herding-although small evidence- in smaller stocks but no evidence in large stocks _RUSS WERMERS -1999-[], analyzing the trading activity of the mutual fund industry from 1975 through,1994 reported much higher level of herding in trades of small stocks and in trading by growth-oriented funds.

[3] LAWRENCE R. GLOSTEN, RAVI JAGANNATHAN, and DAVID E. RUNKLE*-On the Relation between the Expected Value and the Volatility of the Nominal Excess Return on Stocks- THE JOURNAL OF FINANCE v VOL. XLVIII, NO. 5 v DECEMBER 1993

On the other hand, we could write Equ (5) explicitly for ϵ_t _Equ (7) _, and using available data we could estimate the value of ϵ_i for $1 \le i \le N$, where N is the size of the window of data which we are considering for estimating the parameters of the model.

$$\epsilon_t = \frac{-1}{\sigma}\left(\left(\mu - \frac{1}{2}\sigma^2 + J\left(\frac{S_t}{S_0} - \frac{I_t}{I_0}\right) - \lambda J I_{\frac{S_t}{S_0} - \frac{I_t}{I_0}}\right) - Y_{t+1} + Y_t\right) \quad (7)$$

Finally Maximum likelihood method gives us an estimation of the parameters as follows

$$(\lambda, \mu, \sigma, J) = \arg \max_{\lambda,\mu,\sigma,J} f(\epsilon_1, \epsilon_2, \epsilon_3, , , \epsilon_N) = \arg \max_{\lambda,\mu,\sigma,J} \prod_{i=1}^{N} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}\epsilon_i^2} \quad (8)$$

And ϵ_i are obtained using Equ (7).

III- METHODOLOGY AND DATA

We have gathered historical data of the components of 3 indexes, S&P100, Dow Jones Industrial Average, and PHLX gold/silver sector. The data has been provided by Commodity Systems, Inc. (CSI), Morningstar, Inc , and Thomson Financial Network data bases. The information about key statistics of the company was provided by Capital IQ. We have summarized these data in tables 16 to 18, in Appendix Data.

We have categorized the stocks in terms of capital size into 3 categories, Large, Medium, and Small. This categorization is relative according to the largest and smallest company of components of each index. The results are shown in appendix. Also we have categorized them in terms of industrial sectors which are also shown in appendix.

We have computed parameters of our models i.e. J and Lambda using windows of length 5 and 21 and 60 and 125 and 250 days corresponding to working days of one week, Month, Quarter, Half year and one year. We have moved these windows on the data and get a series of J parameter for each length of window and for each stock. The statistical characteristics- Average, Max, Min, and Standard Deviation of these series are presented and analyzed in section IV. We have done the same procedure for computing Volume Weighted J – which has been explained in section II- and the results are presented in section IV.

IV- DATA ANALYSIS

As mentioned earlier we have chosen 3 indexes for our study i.e. S&P100 index, Dow Jones Industrial Average Index and PHLX Gold/Silver Sector. We tried to consider 3 distinguishable collection of asset both in terms of the size of the collection and the industry. Also we expect the asset prices in PHLX Gold/Silver Sector_ which is smaller than the other two_ to have much stronger correlation with their corresponding index. Computed simple J and Volume weighted J and Lambda, using methodology described in section III, for different horizon of time and for each collection are presented in tables 1 to 9.

1. **Simple J** There are several interesting points about the analyzed data presented in tables 1 to 3. First we see that for each collection the absolute value of the average of J has negative correlation with length of time horizon. As in the tables 1 to 3, the average of absolute value of J is decreasing form around 0.7 for weekly periods to around 0.02 for annual periods. Of course this observation is consistent with our prior expectation. As mentioned in section II ,there is a reference time in our model for computing J. as we get far from the reference time, which corresponds to having a long time horizon, we expect that the value $\ln\left(\frac{S_{t+1}}{S_t}\right)$ and $\left(\frac{S_t}{S_0} - \frac{I_t}{I_0}\right)$ lose their dependence and become independent. Therefore it is reasonable to focus on shorter time horizons, weekly and monthly.

The reduction of absolute value of maximum and minimum J, second and third row of tables 1 to 3, can also be explained by the effect of time horizon. On the other hand, as we move further from the reference time the uncertainty about the independence of $\ln\left(\frac{S_{t+1}}{S_t}\right)$ and $\left(\frac{S_t}{S_0} - \frac{I_t}{I_0}\right)$ decreases, so we expect that the standard deviation of J for long horizons be less than that of short horizons. The fact which is observed in tables below.

The stock having higher average value of weekly J in each collection is also presented in tables 1 to 3. HNZ and WAG respectively have the maximum and minimum weekly J in S&P100. JNJ and T respectively have the maximum and minimum weekly J in Dow Jones Industrial Average. SSRI and GG respectively have the maximum and minimum weekly J in PHLX Gold/Silver Sector.

Table 1-Simple J for S&P100

S&P100 Index	J-Week	J-Month	J-Quarter	J-Half Year	J-Year
Average	-0.6805	-0.2242	-0.0876	-0.0498	-0.0254
M	-0.3873,17	-0.1362,48	-0.0525,50	-0.0262,24	-0.0102,24
M	-0.9424,30	-0.3278,69	-0.1464,41	-0.0874,41	-0.0599,41
Std	1.1985	0.2075	0.0802	0.0466	0.0247
Ms	0.8664,20	0.15,42	0.06,62	0.0306,34	0.0146,17
Ms	2.2304, 74	0.2854,61	0.1229,27	0.0786,28	0.0611,28

Table 2-Simple J for Dow Jones

DOW_JONES	J-Week	J-Month	J-Quarter	J-Half Year	J-Year
Average	-0.6755	-0.2184	-0.0868	-0.0489	-0.0241
M	-0.39,17	-0.0143,17	-0.059,17	-0.0301,15	-0.0137,15
M	-0.8347,10	-0.3276,10	-0.1411,10	-0.0832,10	-0.0459,10
Std	1.2907	0.2188	0.0863	0.0496	0.0252
Ms	1.048,14	0.18,17	0.0597,17	0.0345,28	0.0162,4
Ms	1.7654,29	0.2897,10	0.1443,10	0.0862,10	0.0473,10

Table 3-Simple J for Gold

GOLD_INDEX	J-Week	J-Month	J-Quarter	J-Half Year	J-Year
Average	-0.7083	-0.2513	-0.1033	-0.0629	-0.0352
M	-0.3905,1	-0.1587,12	-0.067,6	-0.0311,6	-0.0159,6
M	-1.0309,15	-0.3349,4	-0.1492,11	-0.0927,11	-0.063,1
Std	1.7876	0.3042	0.1133	0.0656	0.0375
Ms	1.3895,16	0.2308,6	0.0843,9	0.0377,6	0.0184,6
Ms	2.4257,8	0.4015,4	0.1475,1	0.1084,1	0.0749,1

2. **Volume Weighted J** Now we look for the effect of considering Volume in computing J. volume weighted J values are reported in tables 4 to 6. Comparing data in tables 1 to3 and tables below shows that when we weigh our data by the trading volume of each day, we get a higher absolute value of J, which means that the negative feedback observed by negativity of J, is more pronounced when we consider volume of trading. This of course is not surprising. Since for a behavioral phenomenon like herding, to be investigated properly it is better to look into highly traded days which have more reliable information about the phenomenon.

Table 4-Volume Weighted J for S&P100

S&p100 Index	VWJ-Week	VWJ-Month	VWJ-Quarter	VWJ-Half Year	VWJ-Year
Average	-0.6974	-0.26	-0.1144	-0.0696	-0.038
M	-0.392,17	-0.169,50	-0.0576,50	-0.0267,50	-0.0088,50
m	-0.9797,30	-0.3745,41	-0.1881,41	-0.1131,41	-0.0756,41
Std	1.2916	0.2586	0.1205	0.0745	0.0431
ms	0.9109,27	0.1962,80	0.0855,47	0.047,4	0.0206,4
Ms	2.263, 74	0.365,56	0.3696,30	0.1619,22	0.0715,28

Table 5-Volume Weighted J for Dow Jones

DOW_JONES	VWJ-Week	VWJ-Month	VWJ-Quarter	VWJ-Half Year	VWJ-Year
Average	-0.7116	-0.2558	-0.1068	-0.0627	-0.0323
M	-0.4061,17	-0.1804,17	-0.0655,15	-0.0311,15	-0.0123,15
m	-0.8557,10	-0.3482,10	-0.1513,10	-0.09,10	-0.0507,10
Std	1.4404	0.273	0.1177	0.0731	0.0392
ms	1.1201,14	0.2149,23	0.0775,23	0.0481,28	0.023,23
Ms	2.749,29	0.3815,11	0.1829,10	0.1246,29	0.0739,29

Table 6-Volume Weighted J for Gold

GOLD_INDEX	VWJ-Week	VWJ-Month	VWJ-Quarter	VWJ-Half Year	VWJ-Year
Average	-0.7241	-0.2912	-0.1412	-0.0915	-0.0558
M	-0.4008,1	-0.1427,8	-0.0861,6	-0.041,6	-0.02,3
m	-1.0624,13	-0.3873,11	-0.1936,11	-0.1332,8	-0.0911,8
Std	1.9882	0.6119	0.1573	0.0981	0.0627
ms	1.4827,14	0.2837,6	0.1119,6	0.0531,6	0.0319,4
Ms	3.2793,12	4.2458,8	0.2334,8	0.178,8	0.1264,8

3. **Lambda** The result of computing lambda for weekly, monthly, quarterly, semiannually, and annually periods, for each collection of assets is shown in tables 7 to 9. As we see the average value of lambda is negative. Using equation (5) and the fact that J is negative most of the times, negative lambda means that the return of an asset underperforming the index is modified by a negative value; $-\lambda J I_{\frac{S_t}{S_0}-\frac{I_t}{I_0}}$. our explanation for this result is that investors show stronger response to bad news than good news. In other word, good news have stronger effect on the trading behavior of investors than bad news therefore an outperforming asset (good news) returns to its initial status faster _by negative feedback role of J_ than an underperforming assets (bad news) returns. This is consistent with Thomas C. Chiang, Cathy W.S. Chen, Mike K.P[] study which was mentioned in Introduction section, and Mark.Grinblatt, Sheridan Titman, and Russ Wermers [1995] who find that "77 percent of the mutual funds were "momentum investors," buying stocks that were past winners; however, most did not systematically sell past losers."

The absolute value of lambda increases by length of the time horizon for S&P100 index. But for the other two collections no specific pattern is recognized. Of course since the value of Lambda is multiplied by J (which has a value smaller than one) in modifying term $-\lambda J I_{\frac{S_t}{S_0}-\frac{I_t}{I_0}}$ a difference of order 0.1 is not so reliable. Therefore the sign of the Lambda is more important to us than its value which we discussed about.

Table 7-Lambda for S&P100

S&p100 Index	Lambda-Week	Lambda-Month	Lambda-Quarter	Lambda-Half Year	Lambda-Year
Average	-2.825	-3.7467	-4.244	-4.3491	-4.3699
M	1.8414,19	0.552,63	0.2236,36	-0.2122,55	-1.3145, 41
m	-7.6116,29	-8.9043,30	-9.8142,5	-11.9308,58	-7.1851,71

Table 8-Lambda for Dow Jones

Dow Jones Index	Lambda-Week	Lambda-Month	Lambda-Quarter	Lambda-Half Year	Lambda-Year
Average	-2.6235	-3.4074	-4.0986	-3.9543	-3.8477
M	-1.3978,15	-1.5161,26	0.1025,7	-1.6215,6	-0.1354,29
m	-5.4549,14	-4.8389,3	-7.975,14	-6.6362,29	-6.3023,22

Table 9-Lambda for Gold

GOLD Index	Lambda-Week	Lambda-Month	Lambda-Quarter	Lambda-Half Year	Lambda-Year
Average	-4.2754	-5.9797	-5.6292	-4.9995	-5.5037
M	-2.725,11	-3.1645,12	-3.4778,16	-1.0867,4	-3.5709,4
m	-7.0139,16	-10.2198,16	-7.8939,11	-7.4638,14	-9.2203,14

F and XRX respectively have the maximum and minimum Weekly Lambda in S&P100. MRK and JNJ respectively have the maximum and minimum Weekly Lambda in Dow Jones Industrial Average. KGC and SSRI respectively have the maximum and minimum Weekly Lambda in PHLX Gold/Silver Sector.

4. **Simple J, Volume Weighted J and Lambda for different industries** In order to compare values for J, Volume Weighted J and Lambda for different industries we have categorized the assets of S&P100 into different industries and computed the corresponding values for them separately[4]. The result is shown in tables below.

[4] That is because PHLX mostly consists of stocks in Basic Material industry, and Dow Jones consists of only 30 stocks which make it unreasonable to have such categorization for these indexes.

Table 10-Simple J for different industry sectors in S&P100

S&P100 INDEX					
	J-Week	J-Month	J-Quarter	J-Half Year	J-Year
Basic Materials:					
Average	-0.7084	-0.2256	-0.0914	-0.0523	-0.0263
M	-0.6249,2	-0.197,9	-0.0785,8	-0.0423,8	-0.0168,8
M	-0.7681,3	-0.2726,4	-0.114,4	-0.0686,4	-0.0407,4
Std	1.0389	0.1948	0.0774	0.047	0.0259
Consumer Goods:					
Average	-0.563	-0.1961	-0.0791	-0.046	-0.0236
M	-0.3966,9	-0.1362,9	-0.0567,8	-0.0262,3	-0.0102,3
M	-0.7885,11	-0.2756,5	-0.1173,5	-0.0672,5	-0.0321,13
Std	1.1364	0.184	0.0799	0.0467	0.0242
Financial:					
Average	-0.7757	-0.2553	-0.1037	-0.0601	-0.0329
M	-0.6228,4	-0.1965,4	-0.0787,4	-0.0463,4	-0.0225,2
M	-0.9424,5	-0.3261,7	-0.1464,7	-0.0874,7	-0.0599,7
Std	1.214	0.2271	0.0943	0.0529	0.0307
HealthCare:					
Average	-0.647	-0.2075	-0.0775	-0.0429	-0.0207
M	-0.5219,4	-0.1538,5	-0.0525,5	-0.027,5	-0.0114,5
M	-0.7078,6	-0.2408,6	-0.0893,6	-0.0517,4	-0.027,4
Std	1.1894	0.2014	0.0428	0.0428	0.0205
Industrial Goods:					
Average	-0.6242	-0.236	-0.0984	-0.0573	-0.0302
M	-0.5519,1	-0.1989,5	-0.0794,5	-0.0456,2	-0.0229,3
M	-0.7825,4	-0.2908,4	-0.1226,4	-0.0749,1	-0.0424,1
Std	1.1771	0.2097	0.05	0.05	0.0276
Services:					
Average	-0.6982	-0.2239	-0.0858	-0.0489	-0.0251
M	-0.4594,3	-0.1608,3	-0.0683,1	-0.0359,1	-0.0168,1
M	-0.7866,13	-0.2555,13	-0.1105,6	-0.0717,6	-0.0384,7
Std	1.2824	0.2115	0.0452	0.0452	0.0235
Technologies:					
Average	-0.735	-0.2297	-0.0826	-0.0447	-0.0212
M	-0.5675,1	-0.1758,3	-0.0645,1	-0.0321,11	-0.0147,1
M	-0.8339,8	-0.2814,12	-0.0986,12	-0.0560,2	-0.0298,2
Std	1.2632	0.2142	0.0428	0.0428	0.0222
Utilities:					
Average	-0.4897	-0.1771	-0.0691	-0.0391	-0.0171
M	-0.3873,1	-0.154,1	-0.055,2	-0.029,2	-0.0128,2
M	-0.566,4	-0.221,4	-0.0788,4	-0.0453,4	-0.0249,4
Std	1.0377	0.1818	0.0413	0.0413	0.0186
Conglomerates:					
Average	0.8072	-0.2627	-0.0998	-0.0557	-0.0287
M	-0.7578,1	-0.2575,3	-0.0937,2	-0.0523,2	-0.0274,1
M	-0.8739,2	-0.2659,2	-0.1054,1	-0.0589,1	-0.0294,2
Std	1.4746	0.2567	0.0495	0.0495	0.0242

Table 11-Volume Weighted J for different industry sectors in S&P100

S&P100 INDEX					
	VWJ-Week	VWJ-Month	VWJ-Quarter	VWJ-Half Year	VWJ-Year
Basic Materials:					
Average	-0.7245	-0.2571	-0.1136	-0.0687	-0.0359
M	-0.6366,2	-0.213,9	-0.0937,9	-0.0538,8	-0.0235,8
M	-0.7966,1	-0.3149,1	-0.1521,1	-0.0954,1	-0.0513,1
Std	1.1088	0.2358	0.1095	0.0724	0.0406
Consumer Goods:					
Average	-0.58	-0.2317	-0.1061	-0.0658	-0.0367
M	-0.416,9	-0.1750,9	-0.0701,8	-0.0374,3	-0.0131,3
M	-0.8005,11	-0.3149,1	-0.1521,1	-0.0954,1	-0.0513,1
Std	1.2121	0.2474	0.116	0.0685	0.042
Financial:					
Average	-0.7953	-0.294	-0.1326	-0.0844	-0.0487
M	-0.6412,4	-0.2399,4	-0.097,3	-0.0547,2	-0.0281,2
M	-0.9797,5	-0.3745,7	-0.1881,7	-0.1131,7	-0.0756,7
Std	1.3274	0.2737	0.0862	0.0862	0.0484
HealthCare:					
Average	-0.6635	-0.244	-0.1052	-0.0629	-0.0328
M	-0.539,4	-0.169,5	-0.0576,5	-0.0267,5	-0.0088,5
M	-0.7187,6	-0.3098,6	-0.1339,6	-0.0807,4	-0.0484,8
Std	1.2831	0.2514	0.0774	0.0774	0.0431
Industrial Goods:					
Average	-0.6411	-0.2722	-0.1291	-0.0817	-0.0472
M	-0.5666,1	-0.2244,5	-0.1035,5	-0.0689,5	-0.0412,3
M	-0.7903,4	-0.3315,4	-0.1623,4	-0.1037,4	-0.0564,4
Std	1.2868	0.2576	0.0823	0.0823	0.0496
Services:					
Average	-0.7166	-0.2618	-0.1152	-0.0696	-0.0378
M	-0.4861,3	-0.2023,3	-0.0731,1	-0.0376,1	-0.0175,1
M	-0.8094,13	-0.2977,17	-0.162,9	-0.0894,9	-0.0508,3
Std	1.3792	0.2736	0.0737	0.0737	0.0439
Technologies:					
Average	-0.7526	-0.2717	-0.1137	-0.0668	-0.0356
M	-0.5846,1	-0.1927,3	-0.0737,3	-0.0393,1	-0.0158,1
M	-0.8529,6	-0.3238,6	-0.1418,10	- 0.0868,10	-0.0500,2
Std	1.3718	0.2607	0.0713	0.0713	0.0420
Utilities:					
Average	-0.4971	-0.2015	-0.0877	-0.0508	-0.0241
M	-0.392,1	-0.1733,1	-0.0709,2	-0.035,2	-0.016,2
M	-0.5688,4	-0.2434,4	-0.0983,3	-0.0603,3	-0.0346,4
Std	1.1127	0.2229	0.0654	0.0654	0.0333
Conglomerates:					
Average	-0.8236	-0.2908	-0.1155	-0.0668	-0.0358
M	-0.7725,1	-0.2849,3	-0.1045,2	-0.0616,2	-0.0333,3
M	-0.893,2	-0.2969,1	-0.1272,1	-0.0747,1	-0.0389,2
Std	1.5565	0.305	0.0743	0.0743	0.0371

Looking table 10, we find that stocks in Financial (-0.7757) and Technology (-0.735) sectors, have the highest value of Weekly J, and stocks in Consumer Goods (-0.4897) and Utilities (-0.563) sectors have the lowest value of Weekly J. this is also the same for Volume Weighted J. The result of Lambda for different industries is reported in table below. As we see Technology (-3.5198) and utilities (-1.8886) sectors respectively keep on to have the highest and lowest value of Weekly Lambda[5].

[5] As mentioned in section IV part A , for comparisons we have considered short period (week and Month) of J, VWJ, and Lambda.

Table 12- Lambda for different industry sectors in S&P100

S&P100 INDEX	Lambda-Week	Lambda -Month	Lambda -Quarter	Lambda -Half Year	Lambda –Year
Basic Materials:					
Average	-2.2986	-4.0439	-5.0132	-5.4744	-4.2188
M	1.8414,3	-3.0193,10	-1.8091,10	-2.7859,4	-2.8827,5
m	-4.9035,11	-6.2609,6	-9.8142,2	-8.9990,6	-5.6101,6
Consumer Goods:					
Average	-2.4544	-3.224	-3.7524	-3.7958	-4.5668
M	-1.0398,3	-2.1155,4	-2.5496,10	-0.2122,10	-1.9007,13
m	-5.0911,12	-4.3863,11	-5.2357,3	-7.7638,1	-7.0254,11
Financial:					
Average	-3.0311	-4.2615	-4.0726	-4.7716	-4.1096
M	-0.3003,14	-2.7237,4	0.2236,6	-0.7912,7	-1.3145,7
m	-5.2509,5	-8.9043,5	-6.5403,10	-11.9308,9	-6.2526,11
HealthCare:					
Average	-3.0127	-3.2974	-4.1262	-4.1694	-4.4317
M	-1.8397,10	-1.1380,4	-2.7062,4	-2.4093,8	-3.8893,8
m	-5.6620,6	-4.8031,1	-6.6043,6	-6.8718,6	-5.3912,6
Industrial Goods:					
Average	-2.215	-3.6726	-3.1952	-3.958	-4.3031
M	-1.5391,1	-2.6203,4	-2.2198,4	-2.8175,1	-2.0043,1
m	-2.7462,4	-5.0025,5	-4.2835,1	-4.5471,3	-5.5505,4
Services:					
Average	-3.1451	-3.7743	-4.3971	-4.1425	-4.414
M	-1.9527,5	0.5520,12	-2.3369,3	-1.2089,17	-3.0590,8
m	-7.3194,17	-7.7029,17	-7.2986,17	-7.8621,9	-6.4824,17
Technologies:					
Average	-3.5198	-4.3	-5.2327	-4.7713	-4.7574
M	-1.7555,9	-1.2012,1	-2.4258,1	-2.1991,1	-1.7976,7
m	-7.6116,6	-7.2222,14	-7.5550,14	-6.9120,12	-7.1851,13
Utilities:					
Average	-1.8886	-2.9361	-3.498	-4.0895	-3.9511
M	-1.5704,2	-2.6596,1	-2.6942,4	-3.9292,3	-3.2086,4
m	-2.2795,3	-3.5730,4	-3.9757,3	-4.4006,2	-4.8720,1
Conglomerates:					
Average	-2.6697	-3.0140	-2.7250	-3.4613	-4.4441
M	-2.2534,3	-2.4450,1	-1.1154,3	-2.0782,3	-4.1224,3
m	-3.1125,1	-3.5840,3	-3.6116,1	-4.2769,2	-4.6302,2

5. **Simple J, Volume Weighted J and Lambda for Small, Medium and Large Companies** As mentioned earlier one of the important characteristics of a company which affects the trading of investors is its size. So it worth to compute J, Volume Weighted J and Lambda for companies of different size. Therefore we categorized the companies in each collection into different groups of Small, Medium and Large companies[6]. These categorizations are relative, according to the largest and smallest company in each collection. Our measure for a size of company is the value of its capital market. Tables 13 to 15 show the computed J and Volume Weighted J and Lambda for these categories. Although we expected to see higher J for small companies, we do not observe any specific pattern.

Table 13- Simple J for different sizes in S&P100

S&P100 INDEX	J-Week	J-Month	J-Quarter	J-Half Year	J-Year
Small Companies					
Average	-0.674	-0.2264	-0.091	-0.0526	-0.0271
M	-0.3873,10	-0.1362,29	-0.055,40	-0.029,40	-0.0128,40
M	-0.9424,15	-0.3278,43	-0.1464,24	-0.0874,24	-0.0599,24
Std	1.1511	0.2026	0.0472	0.0472	0.0256
Medium Companies					
Average	-0.6918	-0.2278	-0.0872	-0.0481	-0.0239
M	-0.4548,6	-0.1608,3	-0.0608,6	-0.0262,6	-0.0102,6
M	-0.8339,11	-0.2756,7	-0.1173,7	-0.0686,8	-0.0407,8
Std	1.2122	0.2223	0.0486	0.0486	0.0257
Large Companies					
Average	-0.6932	-0.212	-0.0752	-0.0411	-0.0204
M	-0.5412,5	-0.1538,11	-0.0525,11	-0.027,11	-0.0114,11
M	-0.8739,14	-0.2702,7	-0.0937,14	-0.0523,14	-0.0294,14
Std	1.3618	0.2299	0.0424	0.0424	0.0203

[6] This categorization has been done on the components of S&P100 , because it consist of reasonable (about 100 stocks) number of stocks, and yield groups of reasonable size of about 30.

Table 14- Volume Weighted J for different sizes in S&P100

S&P100 INDEX					
	VWJ-Week	VWJ-Month	VWJ-Quarter	VWJ-Half Year	VWJ-Year
Small Companies					
Average	-0.691	-0.2644	-0.1199	-0.0743	-0.0409
M	-0.392,10	-0.1733,10	-0.0709,40	-0.035,40	-0.016,40
M	-0.9797,15	-0.3745,24	-0.1881,24	-0.1131,24	-0.0756,24
Std	1.2439	0.2527	0.0781	0.0781	0.045
Medium Companies					
Average	-0.709	-0.2624	-0.1129	-0.066	-0.0349
M	-0.4704,6	-0.2023,3	-0.0771,1	-0.0374,6	-0.0131,6
M	-0.8507,11	-0.3128,12	-0.1418,12	-0.0868,12	-0.0508,3
Std	1.3016	0.2641	0.0678	0.0678	0.0423
Large Companies					
Average	-0.7091	-0.2412	-0.0953	-0.0561	-0.0305
M	-0.5491,5	-0.169,11	-0.0576,11	-0.0267,11	-0.0088,11
M	-0.893,14	-0.3238,7	-0.1332,7	-0.0856,7	-0.0465,7
Std	1.4599	0.2748	0.0685	0.0685	0.0368

Table 15- Lambda for different sizes in S&P100

S&P100 INDEX					
	Lambda-Week	**Lambda-Month**	**Lambda-Quarter**	**Lambda-Half Year**	**Lambda-Year**
Small Companies					
Average	-2.8384	-3.8203	-4.3614	-4.5153	-4.3015
M	-0.3003,59	0.552,37	0.2236,20	-0.2122,31	-1.3145,24
m	-5.662,35	-8.9043,15	-9.8142,3	-11.9308,34	-7.1851,44
Medium Companies					
Average	-2.5891	-3.5351	-3.8596	-4.131	-4.4536
M	1.8414,4	-1.2012,1	-1.8091,14	-1.2089,16	-3.059,10
m	-7.3194,16	-7.7029,16	-7.2986,16	-6.3515,11	-6.4824,16S
Large Companies					
Average	-3.0255	-3.6958	-4.2124	-3.9579	-4.5377
M	-1.7555,12	-2.1155,5	-2.9603,5	-2.1980,5	-1.7976,8
m	-7.6116,7	-7.2222,16	-7.5550,16	-5.3190,16	-7.1200,13

As mentioned earlier the rationale behind this expectation lies in the relationship of herding phenomenon and social Influence phenomenon. We expected that herding among the investor will strengthen the effect of social influence, resulting in increase of J. as far as we know, so far the strongest herding observed –for individual or institutional investors- is for small companies. So we expected that this category will have higher J. the explanation for this inconsistency may be that our data includes fewer than required number of samples of stocks. If we consider S&P500 or other larger indexes, it is possible to observe higher J for smaller companies.

V- CONCLUSION AND FURTHER RESEARCH

We investigated the effect of the relative status of a stock with respect to the whole market .i.e. whether an stock has under or outperformed the index in a period of time, by regressing daily return, i.e. $dY_t = Y_{t+1} - Y_t = \ln\left(\frac{S_{t+1}}{S_t}\right)$ on relative status .i.e. $\left(\frac{S_t}{S_0} - \frac{I_t}{I_0}\right)$. We called the regression factor J. we observed that J is negative most of the time, suggesting that there is a negative feedback in trading behavior in traders. Next we investigated the effect of considering volume of trading in each day, by using volume weighted least square method. We observed that the social influence is more notable when we consider volume of trading. The absolute value of J-both simple J and VWJ-decreases as we increase the length of the time horizon, because as we move away from the reference time the dependence of daily return $\ln\left(\frac{S_{t+1}}{S_t}\right)$ and $\left(\frac{S_t}{S_0} - \frac{I_t}{I_0}\right)$ decreases.

Also we investigated the asymmetry of traders' behavior in response of positive relative status _good news_ and negative related status_ Bad news, buy adding a modifying term which contained Lambda. Investigating the sign of Lambda shows that the negative feedback in traders' behavior is weaker when a stock has underperformed the whole market i.e. has a negative relative status. This result is consisting with other studies suggesting that traders respond to bad news stronger than they response to good news.

We also computed J, VWJ and Lambda for different industries whose result was presented. Also trying to verify our expectation that, more herding results in higher absolute value of J, we categorized the stocks into different categories according to their capital markets. Our observation was inconsistent with our expectation. But this may be due to the fact that our collection has included a moderate size of samples of stocks. It would worth if in future studies the relation between herding on a stock and social effect- as defined in this paper- be considered in more exclusive way.

VI- APPENDIX

Table 16-List of Companies in Gold index

No.	Name	Industry Sector	Size
		Basic Materials	
1.	ABX	Basic Materials, Gold	L
2.	AEM	Basic Materials, Gold	S
3.	AU	Basic Materials, Gold	M
4.	AUY	Basic Materials, Gold	S
5.	BVN	Basic Materials, Gold	S
6.	FCX	Basic Materials, Cooper	L
7.	GFI	Basic Materials, Gold	S
8.	GG	Basic Materials, Gold	L
9.	GOLD	Basic Materials, Gold	S
10.	HMY	Basic Materials, Gold	S
11.	KGC	Basic Materials, Gold	M
12.	NEM	Basic Materials, Gold	M
13.	PASS	NA	S
14.	RGOLD	Basic Materials, Gold	S
15.	SLW	Basic Materials, Silver	S
16.	SSRI	Basic Materials, Silver	S

Table 17-List of companies in Dow Jones index

No.	Name	Industry Sector	Size
		Basic Materials	
1.	AA	Basic Materials, Alumminium	S
2.	CVX	Basic Materials,Major Integrated Oil & Gas	L
3.	XOM	Basic Materials,Major Integrated Oil & Gas	L
		Conglomerates	
4.	DD	Conglomerates,Conglomerates	S
5.	GE	Conglomerates,Conglomerates	L
6.	UTX	Conglomerates,Conglomerates	S
		Consumer Goods	
7.	KFT	Consumer Goods,Food - Major Diversified	S
8.	KO	Consumer Goods,Beverages - Soft Drinks	M
9.	PG	Consumer Goods,Personal Products	M
		Financial	
10.	AXP	Financial,Mortgage Investment	S
11.	BAC	Financial,Regional - Mid-Atlantic Banks	M
12.	JPM	Financial,Money Center Banks	M
13.	TRV	Financial,Property & Casualty Insurance	S
		Healthcare	
14.	JNJ	Healthcare,Drug Manufacturers - Major	M
15.	MRK	Healthcare,Drug Manufacturers - Major	M
16.	PFE	Healthcare,Drug Manufacturers - Major	M
		Industrial Goods	
17.	BA	Industrialgoods,Aerospace/Defense Products & Services	S
18.	CAT	Industrial Goods,Farm & Construction Machinery	S
19.	MMM	Industrial Goods,Diversified Machinery	S
		Services	
20.	DIS	Services,Entertainment - Diversified	S
21.	HD	Services,Home Improvement Stores	S
22.	MCD	Services,Restaurants	S
23.	WMT	Services,Discount, Variety Stores	M
		Technology	
24.	CSCO	Technology,Networking & Communication Devices	S
25.	HPQ	Technology,Diversified Computer Systems	S
26.	IBM	Technology,Diversified Computer Systems	L
27.	INTC	Technology,Semiconductor - Broad Line	M
28.	MSFT	Technology,Application Software	L
29.	T	Technology,Telecom Services - Domestic	M
30.	VZ	Technology,Telecom Services - Domestic	M

Table 18-List of companies in S&P100 indexes

No	Name	Industry Sector	Size
		Basic Materials	
1.	BHI	Basic Materials,Oil & Gas Equipment & Services	S
2.	COP	Basic Materials,Major Integrated Oil & Gas	M
3.	CVX	Basic Materials,Major Integrated Oil & Gas	L
4.	DOW	Basic Materials,Chemicals - Major Diversified	S
5.	FCX	Basic Materials,Copper	S
6.	HAL	Basic Materials,Oil & Gas Equipment & Services	S
7.	MON	Basic Materials,Agricultural Chemicals	S
8.	NOV	Basic Materials,Oil & Gas Equipment & Services	S
9.	OXY	Basic Materials,Independent Oil & Gas	M
10.	SLB	Basic Materials,Oil & Gas Equipment & Services	M
11.	WMB	Basic Materials,Oil & Gas Pipelines	S
12.	XOM	Basic Materials,Major Integrated Oil & Gas	L
		Conglomerates	
13.	DD	Conglomerates,Conglomerates	S
14.	GE	Conglomerates,Conglomerates	L
15.	UTX	Conglomerates,Conglomerates	M
		Consumer	
16.	AVP	Consumer Goods,Personal Products	S
17.	CL	Consumer Goods,Personal Products	S
18.	CPB	Consumer Goods,Processed & Packaged Goods	S
19.	F	Consumer Goods,Auto Manufacturers - Major	S
20.	HNZ	Consumer Goods,Food - Major Diversified	S
21.	KFT	Consumer Goods,Food - Major Diversified	S
22.	KO	Consumer Goods,Beverages - Soft Drinks	L
23.	MO	Consumer Goods,Cigarettes	S
24.	NKE	Consumer Goods,Textile - Apparel Footwear & Accessories	S
25.	PEP	Consumer Goods,Beverages - Soft Drinks	M
26.	PG	Consumer Goods,Personal Products	L
27.	PM	Consumer Goods,Cigarettes	M
28.	SLE	Consumer Goods,Processed & Packaged Goods	S
29.	XRX	Consumer Goods,Business Equipment	S
		Financial	
30.	ALL	Financial,Property & Casualty Insurance	S
31.	AXP	Financial,Mortgage Investment	S
32.	BK	Financial,Asset Management	S
33.	C	Financial,Money Center Banks	M
34.	COF	Financial,Credit Services	S
35.	GS	Financial,Diversified Investments	S
36.	JPM	Financial,Money Center Banks	L
37.	MET	Financial,Life Insurance	S
38.	MS	Financial,Investment Brokerage - National	S
39.	NYX	Financial,Diversified Investments	S
40.	RF	Financial,Regional - Southeast Banks	S
41.	USB	Financial,Regional - Midwest Banks	S
42.	WFC	Financial,Money Center Banks	L
43.	WY	Financial,REIT - Industrial	S
		Healthcare	
44.	ABT	Healthcare,Drug Manufacturers - Major	M
45.	AMGN	Healthcare,Biotechnology	S
46.	BAX	Healthcare,Medical Instruments & Supplies	S
47.	BMY	Healthcare,Drug Manufacturers - Major	S
48.	GILD	Healthcare,Biotechnology	S
49.	JNJ	Healthcare,Drug Manufacturers - Major	L
50.	MDT	Healthcare,Medical Appliances & Equipment	S
51.	MRK	Healthcare,Drug Manufacturers - Major	M
52.	PFE	Healthcare,Drug Manufacturers - Major	L
53.	UHN	Healthcare,Health Care Plans	S
		Industrial Goods	
54.	GD	Industrial Goods,Aerospace/Defense Products & Services	S
55.	HON	Industrial Goods,Aerospace/Defense Products & Services	S
56.	LMT	Industrial Goods,Aerospace/Defense Products & Services	S
57.	MMM	Industrial Goods,Diversified Machinery	S
58.	RTN	Industrial Goods,Aerospace/Defense - Major Diversified	S
		Services	
59.	AMZN	Services,Catalog & Mail Order Houses	M
60.	CMCSA	Services,CATV Systems	S
61.	COST	Services,Discount, Variety Stores	S
62.	CVS	Services,Drug Stores	S
63.	DIS	Services,Entertainment - Diversified	M
64.	FDX	Services,Air Delivery & Freight Services	S
65.	HD	Services,Home Improvement Stores	S
66.	LOW	Services,Home Improvement Stores	S
67.	MA	Services,Business Services	S
68.	MCD	Services,Restaurants	M
69.	NSC	Services,Railroads	S
70.	NYWX	Services,Entertainment - Diversified	S
71.	TGT	Services,Discount, Variety Stores	S

72.	TWX	Services,Entertainment - Diversified	S
73.	UPS	Services,Air Delivery & Freight Services	M
74.	WAG	Services,Drug Stores	S
75.	WMT	Services,Discount, Variety Stores	L
		Technology	
76.	AAPL	Technology,Personal Computers	L
77.	DELL	Technology,Personal Computers	S
78.	EMC	Technology,Data Storage Devices	S
79.	GOOG	Technology,Internet Information Providers	L
80.	HPQ	Technology,Diversified Computer Systems	M
81.	IBM	Technology,Diversified Computer Systems	L
82.	INTC	Technology,Semiconductor - Broad Line	M
83.	MSFT	Technology,Application Software	L
84.	ORCL	Technology,Application Software	L
85.	QCOM	Technology,Communication Equipment	M
86.	S	Technology,Wireless Communications	S
87.	T	Technology,Telecom Services - Domestic	L
88.	TXN	Technology,Semiconductor - Broad Line	S
89.	VZ	Technology,Telecom Services - Domestic	M
		Utilities	
90.	AEP	Utilities,Electric Utilities	S
91.	ETR	Utilities,Electric Utilities	S
92.	EXC	Utilities,Diversified Utilities	S
93.	SO	Utilities,Electric Utilities	S

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