Metropolia

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Potential Use of Web 2.0 Tools in Technical Analysis of Securities

ABSTRACT

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The purpose of this thesis is to examine what, if any, insight Web 2.0 tools can give to an investor on the human factor influencing market behaviour. The hypothesis is that Web 2.0 tools reflect the general population mindset, which in turn mirrors the market fluctuations and trends. Therefore, this information can be used to understand market fluctuations, to detect trends, and to recognize the emergence of market bubbles from the behavioural finance point of view. The information and its potential application is looked at from a purely theoretical point of view.

This dissertation is split into four distinct parts. The first covers behavioural elements influencing the volatility of the market, and whether it is entirely efficient. To understand this, specific elements influencing the decision-making process of investors are considered, specifically herding behaviour, the influences of opinion leaders and overconfidence caused by illusion of knowledge. The second part focuses on defining what precisely Web 2.0 is and what information it delivers, particularly highlighting information it displays on human behaviour. Particular attention is paid to social networks, as they are a perfect breeding ground for formation of bias.

On the basis of the two preceding sections, the tools are analysed from the perspective of what value they carry for investors' trading strategies. Since human sentiment is one of the major factors influencing pricing anomalies in the market, a study on a social network's ability and potential to predict future market fluctuations is analysed. Finally, the last section analyses the various key risks and oversights

occurring in relation to human behaviour elements and the tools discussed.

The findings confirmed that Web 2.0 elements reflect human behaviour, particularly since its [Web 2.0's] design is centred around interaction between users and sharing of opinions and ideas. It has also revealed that just as much as it reveals the human factor, it influences those elements as well. This means that Web 2.0 tools are fundamental in development of trends and herding behaviour.

Keywords	Trend, Web 2.0, social networks, blogs, noise trading
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1. Introduction

Information flow today is constant and easily obtainable from numerous sources and communication channels. The only major tool you need to access it is the internet, and one third of the world's population has it.[1] Since its invention and mass implementation, it has gone through numerous changes. Although the internet is intended to be used as a means of gathering and broadcasting information, most importantly, it is used as a means of communication. Virtual interaction between people, companies, government, and the amount of the information they are bombarded with daily is at its all-time-high. In turn, users voice our opinions and reflect our mindset on the internet as never before. This can be used as an advantage in investment decision-making, as the factors influencing users' emotional state, and therefore, their decision-making process can be observed. Permitting that the market is not entirely efficient due to human behaviour factor, Web 2.0 hypothetically reflects this behaviour through its activity.

Behavioural finance has only recently been recognized in playing a prominent role in market behaviour due to human rational, and often irrational, decision-making. Until recently, it would have been impossible to observe the market performance and to see the emergence of trends from the behavioural financial point of view. This can now be done with the help of the internet tools that are freely available and easy to use.

The purpose of this thesis is to examine theoretical evidence assessing the impact Web 2.0 has on fluctuations in stock markets and its potential use to increase an investor's chance of success. The extent of behaviour and perception influence in investing methodology, and in turn, how much influence the internet has over its users, will be looked at.

The hypothesis of this report is the following: The tools of Web 2.0 can be used to observe emerging trends, on the basis of which, behavioural finance can be better understood. Consequently, market fluctuations can be speculated, since the information posted online reflects the general public's popular opinion and the foundation of bias, thus influencing the formation of herd mentality.

The key objectives of this thesis are to:

- Understand whether the market present today is efficient enough
- Identify the main types of behavioural characteristics observed in the market that influence the decision-making process of investors
- Define Web 2.0 and its impact on the society
- Reflect on the Web 2.0 tools available, and the type of information they provide which may be useful to an investor
- Identify some recently developed tools which may be used in order to understand the mindset of market participants
- Analyse the limitations of Web 2.0 in terms of information it provides for the purposes of investment decision-making
- Understand herding behaviour observed in social networks through the viral spread of information

2. Methodology

The material presented in this thesis is based on secondary research on the subject. Since there is no literature written for Web 2.0 uses for observing behavioural aspects of investment and trading decision making, a number of online articles, books on behavioural finance, literature on investments, and personal knowledge of social networks based on personal use were used. It is assumed that the reader has general knowledge of the basic tools of Web 2.0 and basic understanding of technical analysis of securities referred to in this paper.

The root of this thesis lies in the success of viral marketing and research on social networks' potential to predict the stock market behaviour. This thesis, however, covers various Web 2.0 tools rather than focusing only on social networks. These tools are analysed on the basis of information they provide, their correlation to behavioural factors of the market, and what indication they can provide on future market fluctuations.

The material used for this thesis has been published prior to May 2012. The majority of the tools discussed in this report are currently in 'beta' mode, meaning they are constantly being modified. Due to today's speed of technological progress, it can be

assumed that at any time hence, the tools may no longer exist, have been modified, or have been substituted.

2.1 Literature review

For this thesis, no specific literature has been written thus far. The idea is based on speculation derived from a number of news articles discussing a study proving that market fluctuation could be predicted on the basis of the mood in social networks. Considering that the news articles stated that the study was quite accurate, implication that the markets are not entirely efficient has been made.

To understand why the markets are not entirely efficient, literature on behavioural finance was examined, since it is the only field of study which refutes the efficient market theory (EMH). The book 'The Psychology of Investing' by John Nofsinger pointed out that herding behaviour, along with the illusion of knowledge traders have, were the cause of bias in investment decision-making, and the internet was their rallying cry. Thus it made sense to look further into literature observing how the stock markets and investments work, and why the EMH was not entirely supported by the current market. The book "Investments" by Keith Cuthbertson and Dirk Nitzsche covering a range of investing techniques and strategies pointed out which were more focused on technical analysis, and which covered the fundamental analysis. In the meantime, books and articles such as Leon Levy's "The Mind of Wall Street", "The Human Factor" by Heike Issenhorst and The "Efficient Market Hypothesis on Trial: A survey" by Philip Russel have solidified my opinion that the fluctuations, particularly the constant small ones observed on a daily basis, were the result of human behaviour rather than actual news and events affecting the price.

The article "Twitter Mood Predicts the Market" by Johan Bollen, Huina Mao and Xiaojun Zeng was the driving force behind the idea of tying latest technological developments in internet to market behaviour. However, the research paper proved to be using computing science analysis techniques along with tools which no longer existed. Therefore, it made sense to broaden the scope to Web 2.0, which included all internet developments enabling users to interact, communicate, and develop trends. Thus a number of articles and blogs were consulted to understand the scope of Web 2.0, its varying characteristics in different tools, and what information each could provide, which could influence a trader a biased decision.

Based on the analysis provided throughout this paper, it became obvious that majority of internet tools force opinionated material upon its readers, thus creating bias and herds on certain beliefs. This leads to speculation on how these tools can be potentially used in trading based on trends (noise trading) and what dangers lie in their use and increase of such trading. However, due to flaws in the analytical tools for Web 2.0 technologies present today, the internet cannot be observed as a whole, and neither can tools such as social networks or blogs can be observed as a whole. Therefore, there is a possibility this leads only leads to further bias. [Psychology of Investing 2008]

3. Behavioural elements observed in financial markets

Before looking into the numerous ways Web 2.0 tools can be used to provide insight on market behaviour, it is important to determine the efficiency of the market, thus establishing a basis of the hypothesis. In an entirely efficient market, it is impossible to outperform the market, thus contradicting the whole purpose of this report. Therefore, behavioural elements observed in financial markets will be looked at, which can reveal that the efficient market hypothesis is not wholly applicable to the market present today, due to the presence of the human factor. Such behavioural influences on the market fluctuations can be observed in such phenomena as herding, investor's perception of the knowledge they possess, and the opinion leaders present.

3.1 Efficiency of the Market

When looking at the stock market, the following statements are true according to the theory:

1. The market is efficient, meaning that all relevant information, be it public or private, is automatically absorbed into the current share price and reflects its true value. Consequently, the possibility of outperforming the market on a regular basis is excluded. Higher returns are directly correlated to riskier

investments, and no undervaluation or overvaluation of stock is therefore possible. [Cuthbertson and Nitzsche 2008 : 13]

2. Random walk is present in an efficient market, thus no indication of market prices' movements exists in historical price information and all the fluctuations do not follow any particular path. [Cuthbertson & Nitzsche 2008 : 341]

Those theories also have two assumptions in common:

1. Human beings are rational in their decision-making, and
2. Their predictions are unbiased.

However, all of the above statements have faced widespread criticism in the past from a socioeconomic point of view, and the two assumptions on which the field of finance has been based have been overturned by behavioural finance. Upon these assumptions the market is built, but human behaviour is far from rational, and due to a number of influences surrounding us, bias is inevitable.

The theory states that the key factors of any investment decision are based on the factual information the investor possesses, the forecast on potential demand of the product or goods produced by the company, the types of existing stock and possible increase of stock volume, and naturally, the customer's preferences. Although all but one are rational points, except for customer's preferences, in many cases, not each and every one of them is included behind the reasoning of acquiring one stock instead of another.[2]

According to Keynes,

> "Even apart from the instability due to speculation, there is the instability due to the characteristic of human nature that a large proportion of our positive activities depend on spontaneous optimism rather than on a mathematical expectation, whether moral or hedonistic or economic. ...Our decisions-...-can only be taken as a result of animal spirits – of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities." [3]

This statement perfectly reflects the behaviour observed in the markets. To take risks and to speculate occurs naturally in human beings, which can be attributed to

overconfidence, bias, and other factors. Therefore, the efficiency of the market may be debated.

Philip Fischer pointed out that "at any one time the market 'efficient' prices are assumed to reflect fully and realistically all that is known about the company." [4] The efficiency of the market, by definition, is not determined by the speed of the transactions, or even the smallest adjustments of the stock prices and market indexes reacting to the constant transactions made by buyers and sellers. Thus no excessive profit may be made in an efficient market, unless insider trading occurs.

3.2 Types of Behavioural influences on market fluctuations

It has been observed that herd behaviour occurs in stock markets, since neither price fluctuation are attributed to new information received nor major variable changes occurred. [5] This is due to behavioural aspects of investment and trading. The decision-making is influenced by the interpretation of information, the emotions experienced, the macro-economic influences, and more.

Behaviour finance is commonly referenced when pricing anomalies occur, and this field of study bears the only explanation. This implies that a possibility to make nonstandard returns is present. Even though human psychology plays a major role in market behaviour, it does not examine potential hidden risks present in the stock price. Below, the three main behavioural factors influencing stock market fluctuations are examined.

3.2.1 Overconfidence, herd behaviour and opinion leaders

Studies have shown that higher volume of trading with high returns during one trading months impacts the consequent several months of trading. This occurs due to investors believing their success is due to their own expertise, thus resulting in overconfidence and triggering higher risk-taking behaviour. The more success the investor experiences, the more he is willing to increase his risk. Such effect is observed

in bull markets, and the opposite occurs as soon as the market transforms into a bear market.

Overconfidence occurs due to illusion of knowledge the investor possesses. Web 2.0 section demonstrates just how much information users are exposed to through the internet. The issue lies in what information the investor chooses as important and his interpretation of it, particularly, if that investor is not a professional. This leads to risk perception being distorted, and the formation of bias. [Psychology of Investing 2008]

Another form of bias formed is on a much larger scale, and is referred to as 'herding' in the market. People tend to discuss stock markets and their opinions of it. John Nofsinger in his book on the Psychology of Investing made the following observation, "As you learn what other people think about various stocks, the social consensus forms. As people act on this consensus, a herd forms. ... The problem with moving with the herd is that it magnifies the psychological biases. It causes one to make decisions that are based on the "feel" of the herd instead of the rigor of formal analysis." [Psychology of Investing 2008 : 79]

This behaviour has incredible effect on the stock markets. However, in any formation of public consensus, there are always opinion leaders present. Such persons' opinions are considered to have more credibility than that of others, even if their view is biased. Such people impact the direction the general consensus would be formed.

Paul Tetlock's observation on the 'Abreast of the Market' articles in the Wall Street Journal illustrates perfectly how opinion leaders impact the behaviour of the herd. In his study, he pointed out that, "High levels of pessimism or optimism in the morning article lead to unusually high trading later that day." [Psychology of Investing 2008 : 78] These articles provided no concrete new information, but impacted the market index. However, the effects would be reversed within days, due to such information not bearing any weight behind it. This is because the readers are lead to believe that the experts who have provided us with their conclusions have founded their opinion on the basis of thorough analysis. [Psychology of Investing 2008 : 78]

All of these behavioural elements together, particularly the herding aspect, may be amplified by internet tools, which facilitate the spread of information at an exponential rate. This results in over- or under- valuation of stocks, speculation, formation of

market bubbles, non-new information supported fluctuations, and more. All these support the hypothesis that the current market is not entirely efficient.

Although the effectiveness of the market present have today is a topic of widespread disagreement, based on Fischer's definition of efficiency presumed in the market, human behavioural factor in investment decisions does not fit the description. This is due to the market assumption that human beings are rational and unbiased. The irrationality of human behaviour forces the market to react and fluctuate to an extent. This can be observed in herding behaviour often occurring in the market, when for example, a number of people start buying or selling stock for no apparent reason.

3.2.2. Impact of human behaviour on market efficiency

The volatility of securities is affected by a number of factors, but the most basic reason lies in its supply and demand among buyers and sellers. When short term investors start buying or selling stock on the basis of the share price going up or down, disregarding other information on the stock, momentum buying/selling occurs, fundamentally causing herd behaviour to occur. The bigger the herd participating in the momentum buying (or selling), the more the demand of the stock is affected, resulting in attraction of even more people. [6] The losers in this scenario are the ones who have joined the herd too late and left the herd too late. Interestingly, momentum buying is more popular than selling, as investors tend to hold on to the losing stock. The disposition effect happens due to overconfidence and reluctance to acknowledge making an error. [Cuthbertson & Nitzsche 2008 : 330] This effect disproves the efficient market theory on the basis of irrationality in the decision-making process.

Human psychology and the emotional state of the investors play a major role in disregarding the random walk theory, and thus efficiency of the market. For example, the random walk theory excludes any possibility of cycles happening, but they can be observed on a weekly, seasonal, and yearly basis. For example, the Weekend Effect, also known as the Monday Effect, refutes the efficient market hypothesis by the prices of shares being generally higher on Fridays and lower on Mondays. The January Effect is very similar to the Weekend Effect, when the prices are of stock are generally higher in the beginning of the month, than prior to the end of December results. All of these

effects have psychological drivers, and impact the market on the basis of the human factor, and not information. This proves that the current market is not entirely efficient, and through observation of human behaviour in the market, it is possible to increase the success rate when trading. [Cuthbertson & Nitzsche 2008 : 324]

This leads to the next section on Web 2.0. Since the internet is considered to be the meeting place of opinions and information, it is mandatory to examine the tools it has to offer in terms of information it provides and behavioural influences it possesses.

4. **Web 2.0 definition and potential application in investments**

The term 'Web 2.0' stands for 'second generation of the world wide web', which allows its users to interact, collaborate and share information with other users. Its design facilitates open communication and creation of online communities, which have had an enormous impact on businesses and their marketing techniques, people's daily lives, the financial markets, and much more. With its use, a thought or an idea could spread through social circles and niches with incredible speed and impact the 2 billion web users that there are present today. [7, 8, 9]

The internet, over a short period of time, has evolved into a far more interactive virtual world, where information and people's opinion on that information is easily accessed and recorded. The impact has been tremendous. Although Web 1.0 and Web 2.0 are two inseparable aspects, as one has evolved from the other, the key differences are found not only in the technological advancements and website building, but also in terms of the design focusing on user participation. Knowledge of computer code is unnecessary for posting anything online now, and sharing of ideas and virtual interaction between people is easier than ever. Communication has become two-way; any one person with access to the internet could now contribute. Nearly every website now provides the possibility of interaction between the reader and the user who posted the information.

With this evolutionary step, a number of new communication and information channels opened up, for example YouTube, Google (as it is today), Facebook, Twitter, Wikipedia, and the list goes on. As it keeps evolving and becoming a substantial part of people's daily routines, its potential is difficult to grasp. Recent years have shown the

impact of Web 2.0, specifically social networks, on the society. It has substantially reshaped the world, where transparency in information, businesses and governments is more demanded than ever.

With the help of Web 2.0, search engines and social networks are able to compile a profile on a user based on their searches, the webpages they frequent, the information they input into the social networks and so forth. Since information is the key factor impacting the markets, Web 2.0 provides it in abundance. Organizations are already using that data to improve their strategies and boost their business ahead of the competition. Applying the same approach, could an investor could potentially use the Web 2.0 tools to understand the market better, as well as increase his success rate in choosing better investments.

When investing in stocks, the first sources of information usually are a general overview of the participants in the market, recent developments and deciding on the investment and trading strategy to be used, if not developed yet. Then, more in-depth research is conducted on potential companies worth investing in through review of the annual report and most recent news on the company and its sector. Doing financial calculations comes next, and based on all of the above information gathered and analysed, the decision on the investment is made, or so it is with the theoretical approach. However, stock market fluctuations are oftentimes irrational, and the sole factor behind it is the human behaviour. Coincidently, the best source for information on that matter may be the internet, specifically Web 2.0.

To cover all the tools Web 2.0 offers is impossible in this paper, and even more so, as many new ones are constantly being developed. Therefore, the following sub-sections will be looking at what information some of the most popular current tools can provide an investor with, and whether any indicating behavioural information is displayed. On that basis, speculations can be formed whether the information reflected in such tools as social networks, blogs, and web applications can aid in understanding market fluctuations better from a behavioural finance perspective.

*The following two terms will be frequently mentioned in the examination of Web 2.0 tools.

Trending – refers commonly to social networks such as Twitter, meaning the topic is currently being widely discussed. Also can be referred to as a subject currently searched for and viewed by users; 'trends' used in the same context.

Buzz – synonymous to 'trending', but includes a wider spectrum.

4.1   Web 2.0 Tools Categorization based on information they supply

Web 2.0 can be categorized in a number of ways, depending on whether it is looked at from the perspective of the type of communication it hosts, or as a technological tool. The following tables reveal the two different ways of how Web 2.0 tools can be categorized.

As communication channels:

This table portrays the types of interactions Web 2.0 provides:

Variations of communication purposes
Consumer to Consumer Web 2.0 –   one consumer (user) contributes information and opinion for another user/consumer; E.g. social networks, Wikipedia, Youtube, GoogleDocs
Business to Consumer Web 2.0 –   interaction between the two, mostly for the purposes of the business aiming to improve their product or service
Consumer to Business Web 2.0 –   the business does not directly interact in this tool, but often sets up platforms to gather information first-hand from consumer; customers oftentimes share their opinion on the business, especially if it is negative feedback
Business to Business Web 2.0 –   information shared is regulated and communicated through internally set-up platforms
Enterprise 2.0 (Internal Business Web 2.0) –   same principle of a social network, but secure and entirely internal

Figure 1: Classification of Web 2.0 communication channels by varying business and consumer interactions.[10]

Of all of the above, Enterprise 2.0 and B2B Web 2.0, will not be looked into for the purposes of this thesis, as they are updated on a less frequent basis and do not contribute substantially to behavioural qualities of an investor. Additionally, the information published in these channels is impossible to obtain externally.

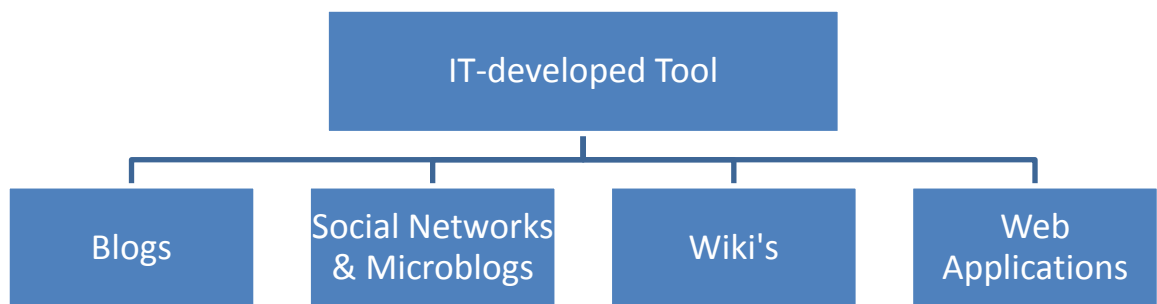***As an IT developed communication channel tool:***

Figure 2: Categorization of Web 2.0 tools by its technological developments [11]

*Microblogging is included as part of the social networks, due to the similarity of characteristics shared between the two, and its purposes.

The following table illustrates what type of communication is covered for each of the Web 2.0 technological tools. (Letter "A" stands for "Available", meaning that this form of communication channel is used in that specific Web 2.0 tool.

	C2C	B2S	C2B	B2B	Enterprise
Blogs	A		A	A	A
Social Networks	A	A	A		A
Wiki's	A				
Web applications	A	A	A	A	A

Figure 3: Web 2.0 tools categorized according to the communication channels they host.

From the chart above, it is obvious that all Web 2.0 technological tools share one common factor – they involve consumer to consumer interaction. However, all four deliver information in entirely different forms.

To understand the value of information from each of the IT tools' presented, the following SWOT analyses are constructed under each corresponding section to understand their potential value in identifying trends. Although analysing the tools in this manner may seem unconventional, instead of pro's and con's, it is justified by their complexity.

4.1.1. Blogs

Blogs are similar to an online journal lead by one person or a group of people, expressing opinions on particular topic. These are an excellent source of in-depth qualitative data, since oftentimes, the writer or blogger focuses on a specific subject.[11] Although the knowledge range on a subject may vary, as well as the writer's opinions, a certain amount of research and interest goes behind each blog post. Over 150 million blogs exist, but only a small percentage bear a substantial amount of influence over its readers.[12] For example: Becker/Posner blog, the Business Insider, or Mish's Global Economic Trend Analysis blog, to name a couple. Such blogs should be recognized as opinion leaders for investors, as they are considered to bear information based on thorough analysis, and thus are trusted by the public.

Strengths	Weaknesses
- In-depth information on a topic - Themed blogs are popular, implying that the information posted relates to a specific topic of interest of the blogger	- Posts are not written on as frequent basis in comparison to micro-blogging websites
Opportunities	Threats
- Many bloggers, particularly in financial field are analytical in their posts, rather than reflecting the key facts delivered by the news media - Predictions made have supporting information	- Weight and impact the blogger's opinion on the public (impossible to determine this factor)

Although blogs on shared topic often echo one another in the information they present, each is slightly modified based on the opinion of the writer. The distortion is increased as soon as analyses upon analyses are conducted upon an initial analysis, resulting in misinformation. Therefore, the sources on which the blogger is basing his analysis on should be examined, in order to prevent further distortion of information.

4.1.2. Wiki's

Wikis are, in a way, collaborative online encyclopaedias, designed to provide general overviews on various topics. Wikipedia is the most known one, however, many more exist. [11]

They have been excluded as a tool which could indicate emerging trends and market jumps. While many believe in the validity of the information stated in such online collaborated encyclopaedias, it is a reference point for general information, not a behavioural indicator.

4.1.3. Social Networks

Social networks are online communities, where each user has a profile page with the information they wish to disclose and update their page by posting messages, pictures, videos, and etc. Its main purpose is for users to interact and communicate with each other.[11] Additionally, many companies have started joining social networks, as it enables direct contact with their consumers and potential customers. Some of their basic characteristics include:

- status updates (limited to 100-250 characters per post usually)
- pictures and video sharing
- 'following' feature of a person's likes interests (ranging from hobbies and idols/celebrities, to brands and specific products)
- possibility for other users to comment on all information posted

- reposting and forwarding the information to the user's circle of friends/users
- user has a filled out 'personal details' sheet
- constant feed of messages and updates
- constant referrals to other sources of information (e.g. found in blogs, video blogs, news, etc), thus spreading it virally

This sub topic is more complicated due to varying communication resulted in common confusion between the difference between social networking and social media. Social networks, through social media, reflect the sentiment of the information circulating around. Although the majority of that information comes from mass media such as news broadcasts and websites, there is a two way exchange, since such channels are picking up the trending topics from social media on a more frequent basis as before. In other words, social media is the information conveyed onto online users, and with the help of social networking websites, buzz is created around the topic through discussion. The power of social media and social networks cannot be underestimated.[13] In the past couple of years, it has already managed to cause revolutions, riots, rise and fall of businesses, and impact business strategies.

Social networking over the past several years has become the number one activity on the internet. The recently emerged phenomenon is micro--blogging, which is one of the base components of such online systems. Websites such as Twitter, Facebook, Youtube, Qzone and Vkontakte are among the social networks with the largest user base, each hosting a community of over a 100 million users. Facebook alone is nearing its billionth user in the near future.[15] Appendix 1 lists the social networking sites with over a hundred million subscribers. Appendix 2 shows the geographical distribution by popularity of such networks.

Facebook and Twitter remain as the most popular and the fastest growing social networks globally, however, there are particular regions of the world where other similarly structured networks function and have a dedicated user base. This causes a further informational imbalance, particularly from the perspective of globalization. Interpretation of information and trending topics may vary in different regions of the world due to macroeconomic influences. The following SWOT analysis demonstrates social networks' potential in the information it provides.

Strengths	Weaknesses
- Constantly growing number of users joining social networks - Users willingly and readily sharing information and opinion online - Speed with which information reaches millions of users - High interaction level between users	- Restriction of who may view the information posted (e,g, not being in the circle of friends restricts the information available on the user and their posts (Facebook)) - Impersonators and unreliable/false information spread in form og rumours
Opportunities	Threats
- Observing emerging trends (The trends are created via the social networks due to quick and vast spread of interest) - B2C and C2B communication increases the success rate of the business(if properly exploited) - New applications of varying purposes being developed for social network platforms	- Transfer of users from one social network to the other when interest dies (e.g. Myspace users transferred onto Facebook.) - Legal issues arising due to some actions done on behalf of the company (privacy concerns)

Due to global popularity of two specific social networks (Facebook and Twitter), a detailed overview can be found in Appendix 3. Although both are excellent marketing instruments, both are analysed from the perspective of the benefits each may provide for an investor.

Messages that reflect human behaviour and sentiment is the type of information that is focused within circles of friends indicated in the network. However, popular impersonal information spreads with incredible speed. It has been observed, that an average user spends more time on Facebook (averaging 21 minutes) than a Twitter user does on Twitter (13 minutes).[16] This may be attributed to the fact that Facebook's design is centred around the circle of friends, in comparison to Twitter's design focusing more on the user himself or herself. Thus, the average user is exposed to an extensive amount of information other people are talking about.

4.1.4 Web Applications

This is a slightly different tool, as thousands of various web applications currently exist and are being constantly developed, and their uses just as diverse. Technically, it is customization software which is developed for a network, having a specific purpose and functionality – entertainment, analysis (useful and useless), webmail, newsfeed, or relating to a specific service or product, to name a few. In essence, programs which are written for the internet and to be hosted via a browser.[23]

Web applications cover the entire spectrum of the communication categories. One of the interesting purposes is the analytical and the information gathering ones. The main advantage of such tools is that it is instantaneous and incorporates the latest information. The following SWOT analysis illustrates the capabilities of web applications.

Strengths	Weaknesses
- Many applications providing useful tools such as automatic categorizing and statistical analysis on a website, social network, trend, and application itself - Most applications are free - Simplicity in design and utilization	- Many applications are in Beta form (meaning in development)
Opportunities	Threats
- Applications are constantly developed and updated. - Potential for more thorough automatic analytical applications to be developed	- Discontinued improvement of the Beta versions of applications if interest is not high enough - Legal issues arising due to arguments on privacy, piracy or lawsuits on similarity of applications (particularly if it brings profit to the designer of the application)

The following three web applications are interesting tools that provide an example of the range of purposes that can be utilised in investment decision making process. Their functionality is briefly described below.

1. Google Alerts

This tool is particularly useful as it supplies the user with quality information from primary sources – the news. Instead of spending lengthy time searching for all the relevant news on a business, product, or industry, Google alerts provides a simple solution. The user enters keyword related to the topic of interest, the email address to which alerts can be sent, and the frequency the users wishes to have those alerts delivered. The emails then consist of the latest news from reliable sources, involving the topics the user entered, with a short preview of the article's content. This is a convenient and quick way to gather the latest information on, for example, the company the user is invested in or is planning to invest in.[24]

2. Google Insights for Search beta

An interesting tool examining the interest of any particular topic of interest based on the number of times it has been into Google's search engine over time, in comparison to all searches on Google. The data is further visually displayed in the form a world heat map depending on the popularity of the searched keyword by regions. It also displays the top search terms used in regard to that topic, and the rising searches showing increasing interest of the public. Furthermore, each of those related topics can be also individually analysed and compared to other searches in a single graph over a specific period of time. It also displays the top and rising (breakout) searches featuring the same keyword(s). It also forecasts how the search topic of interest could be in the near future, based on the analysis it conducts of the historical data on the searched topic interest. The reasons for increased search activity of the topic must be investigated, but with the top and rising related searches. This can detect whether the general consensus and sentiment are negative or positive on a particular, thus indicating how the market participants may behave.[25,26]

3. Twitter Sentiment

Tool which has great potential in being developed into an analytical tool of human behaviour as tracked through the social network. A keyword is entered into search,

and the latest tweets are displayed and categorized into having either a positive or negative feel. At the moment, it only looks at the tweets two dimensionally – positive or a negative post. The results are displayed in a chart, displaying the sentiment by count and per cent as based on the latest tweets involving the keyword.[27]

4.2   Diffusion of Information

In order to understand how trends are created and amplified through the use of Web 2.0 tools, it is best to look at how information spreads throughout the internet. The concept of a 'buzz' can indicate potential herding behaviour, and in this section diffusion of information from opinion leaders to the general public can be observed.

Social networks have been used by businesses for marketing purposes for some time now. The way it works is through creation of 'buzz' around a specific topic, product, company, or service. A number of users are exposed to that specific information and repost it, thus exposing it to their circles of friends and subscribers, and these groups of people, in their turn, expose it further. If it catches the interest of the public, then it spreads like wildfire.

The popularity of social networks thrives on participation of its users, and the majority of the like to voice their opinion. After all, it is the perfect tool to make your voice heard. Through updates, the user does not directly communicate to a specific person, but to all the users they are connected to. Thus, as each person shares a different circle of friends/followers/subscribers, with each re-post, the initial information is directly exposed to a larger audience.

A perfect example of how the information travels through the internet (and particularly social network) can be portrayed through the product diffusion curve. Material can range from discontent and criticism, to general news and latest developments to funny video.
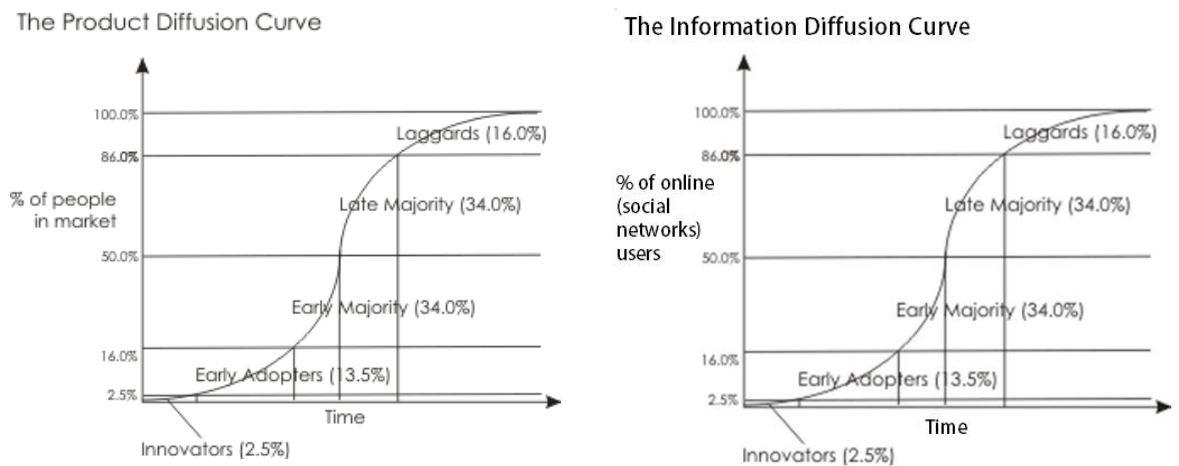
The Product Diffusion Curve

% of people in market

100.0%
86.0%
50.0%
16.0%
2.5%

Laggards (16.0%)
Late Majority (34.0%)
Early Majority (34.0%)
Early Adopters (13.5%)
Innovators (2.5%)
Time

The Information Diffusion Curve

% of online (social networks) users

100.0%
86.0%
50.0%
16.0%
2.5%

Laggards (16.0%)
Late Majority (34.0%)
Early Majority (34.0%)
Early Adopters (13.5%)
Innovators (2.5%)
Time

Figure 5: Left – Everett Roger's Product Diffusion Curve as observed in marketing [28] Right – Everett Roger's Product Diffusion Curve adjusted to diffusion of information perspective, particularly trends; shows the stage of appearance of information/trend on the web, steep increase in its popularity through the information being diffused via social networks, and decline in interest as the number of searches, views, and re-posts of that information dramatically decreases, indicating end of trend.[28]

In contrast to the product diffusion curve, the time period passed between innovators to laggards is considerably quicker.

It must be pointed out that social networks are mostly a secondary source of the information diffusion process. These platforms serve as an attractor of an audience. However, no guarantee to the legitimacy of information posted in such networks exists, even when coming from seemingly primary sources (e.g. an official page of the company on Facebook or Twitter). The problem is that there are many impersonators online, thus news and official websites (e.g. of a company) remain the primary source of information. However, it is becoming more common for information to reach official traditional news channels due to its widespread popularity in the social networks.

For example, the efficiency of social networks spreading information can be seen in the most recently emerged famous 'KONY' video on Youtube.[29] Although this video has nothing to do with behavioural finance, it shows the speed with which information spreads today – in less than a month, it has reached an audience of nearly 90 million people.[30] In the statistics section provided for the video, the 'information' diffusion curve is highly visible. However, it should be noted that in majority of the cases, the information spreads more gradually, with the diffusion process resembling a linear

increase, rather than an S curve, which is relevant only to major trends going instantly viral and soon after losing its trend status.
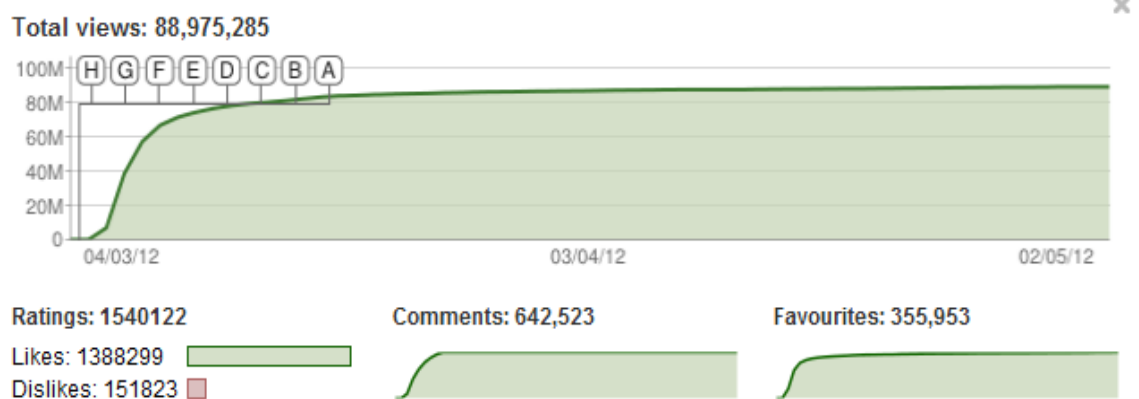

Figure 6: Statistic chart portraying the speed and the number of people a trending topic reaches [30]

This demonstrates just how fast information reaches millions of users worldwide, thus influencing their decisions and their view of the world. This effect has been observed and used for development of viral marketing techniques. In its turn, this has a tremendous impact on the financial markets.

4.3. Problems with the tools

The two major issues obvious from the SWOT analyses provided, are the information imbalance and the quality of that data. It appears that through viral spread of information throughout social networks, only information which has gained a certain level of popularity is highly visible. The other problem relates to the bombardment of information everywhere, thus sorting, categorizing, and analysing relevant information becomes an incredibly difficult task. The extent of publicity is determined by the chance of chain reaction of re-posts happening. The information posted online most of the time is not based on strictly factual information and its analysis. Through the informational imbalance, along with sentiment, a bias is formed and presented for the reader.

The recurring problem with social network sentiment analysis tools is the programs' interpretation of the searches based on their definition. While it is easier to let the programs do the analysis, the tools currently available are nearly all in beta forms, with a long ways to go. This is true particularly in analysing human behaviour through social networks. The applications simplify the analysis down to a specific range of emotions, if not down to only two – negative and positive.

The validity of information posted on the web can be questionable. The spreading of rumours across social networks and the entire web is a common occurrence. This leads to further informational imbalance and bias, especially when herding behaviour is observed in people spreading such rumours virally. Metaphorically, it occasionally works like a broken telephone, when interpretation and opinion is piled on the original data.

Misinformation can also occur due to problems with data sampling, meaning that the section of information analysed does not completely reflect the actual situation. This happens when not all relevant information determine is included in the analysis. For example, when determining whether the behaviour of stock valuation will rise or fall based on the information on the business and the sector it is in, and excluding the supporting industries, which also affect the security's price.

5. Application of Web 2.0 tools in investment decision-making process

In the previous section, Web 2.0 and its numerous tools were only briefly looked into. Its full potential and risks are hard to comprehend due to the amount of information it holds and constantly absorbs, and which information will be absorbed by the users. There are two main types of financial analysis of stocks and market behaviour – fundamental and technical analyses. The fundamental analysis focuses on the economic factors affecting the stock through the examination of the company's financial statements and application of formulas to determine ratios, which can indicate future performance of the company. It is also very time-consuming and aimed at longer-term investments. Technical analysis, on the other hand, focuses on trends and

price movements of the stock as being an indicator for future stock price fluctuations. This form of analysis is intended for shorter-term investments, since price fluctuates on a constant basis. [41]

Web 2.0 tools have the potential to serve as the perfect source of information for technical analysis, as it can be used to observe trends, general sentiment, and people's thoughts and opinions on various specific topics, and patterns on such behaviour. Although many of those tools are not perfect in terms of the outcomes they deliver, they can process and find information valuable for identifying the human factor affecting the markets. In this section, the different ways Web 2.0 can be used for investment purposes are discussed.

5.1 "Twitter Mood Predicts the Stock Market"

The research paper "Twitter Mood Predicts the Stock Market" has been written on the mood of the web reflecting the behaviour of financial markets and how that information may be used in order to predict short-term future market fluctuations. Social networks, particularly Twitter, have been used to determine the general sentiment. This is due to the design of the network, the purpose of which is to post micro messages on their page. Another main reason why it is popular with researchers is due to limited restriction of access to users' updates.

The study, conducted by Johan Bollen, Huina Mao, and Xiaojun Zeng explores how the mood of Twitter can be determined through its newsfeed with the help of analytical tools, and whether correlation between it and the Dow Jones Industrial Average (DJIA)-values exists, and if there are indicators present to predict future stock market fluctuations. Their research is based on the impact of emotional state influencing the decision making process of a person, but looked at a larger scale through compilation of individuals' moods into a more general sentiment of the web.[31]

In accordance with the random walk theory, market behaviour predictions have only 50% valid chance of being correct. As efficiency of the market has been argued in the beginning, stating that the share price reacts only to relevant information, indicating that news cannot be predicted in any way or form, unless insider trading occurs. This

supports the efficiency of the market. However, the study on Twitter's mood predicting the stock market provides certain insight into economic factors, which in their turn influence the stock market. [31]

The idea is the same as in viral marketing strategy, which uses Web 2.0 and particularly social networks to spread the message, and the 'information' adaptation curve can be used to observe how the message spreads, except in social networks it looks more of an immense spider web, with each stage, the message penetrates more social circles, spreading onto various Web 2.0 tools available.

Even though the study was conducted in 2011, the tools (OpinionFinder and Google Profile of Mood States (GPOMS)) that were used to analyse the mood of Twitter posts are no longer available today. GPOMS was a particularly interesting tool, since it looked at the tweets 6-dimensionally (calm, alert, sure, vital, kind and happy). Series of tests to determine causality between stock market fluctuations and general sentiment observed on Twitter were conducted. Their findings pointed out that there is a clear correlation between the tweets and the closing daily values of DJIA, and it was best reflected by tweets expressing a 'calm' state as defined by GPOMS tool. With general categorization between 'negative' and 'positive' moods, the predictions were less conclusive in predicting DJIA's closing values. The result showed that GPOMS' statistical measure based on the 'calm' posts correlated with the DJIA movements, but with a delay of 3 days, thus providing forecast on DJIA's closing values 3 days into the future.[31]

However, there are a series of problems with this study. First of all, the tools used are no longer available. The existing similar web instruments can only analyse the mood of the web 2-dimensionally (being positive or negative) and one keyword at a time. Second, it looks only at Twitter posts as the single factor influencing market fluctuations, thus assuming that the market is not efficient. Additionally, geographic and tweet distribution per user is not taken into account.

5.2. Establishing an investment strategy based on type of information provided in Web 2.0 tools

From the material provided earlier, one statement is certain – the internet does reflect its users' lives. It reflects 1) the events happening in the world, 2) the opinions on the information users receive, and finally, 3) their general sentiment. Thus, depending on the investment strategy, each of the three can be used as a behavioural indicator in market fluctuations. The benefits and disadvantages of each will be analysed below.

5.2.1. Information based on the real-time events occurring

As the market absorbs all relevant information as soon as it occurs, media coverage is just as instantaneous. Since Web 2.0 has incorporated interaction between users and promoted the diffusion of information and opinion, it is important to monitor what actual events are happening in the world and in the company the securities are invested with. Understanding the ties and influences between different sectors is also vital. Sole recognition of competing products and companies is not the only key information that is absorbed into the stock price. The relevant information affecting the price changes is not only found in the company's transactions and latest operations, but also through the sectors it is tied to. Therefore, tracking relative news helps identify the underlying reason behind some trends, and determine their validity.

5.2.2. Opinion on the information received

Today, the financial markets are as ever interconnected. Web 2.0 is the perfect tool of globalization and increasing interconnectedness with the rest of the world. It also impacts the way the users process the information they receive and find online. Through secondary sources of information such as the social networks, the facts received from primary sources of information (e.g. from news), the information then travels onto the social media, where it is assessed and commented on by the public. Thus, information may become distorted due to opinions formed by the person who is distributing this information, thus biasing others' understanding of it as well. If that information creates enough buzz in the online community of early adaptors as it is spreading onto the early majority, herd behaviour can be observed.

Opinion on the information received, however, can be perceived from a different perspective, as it can generate speculation. According to the old saying, "buy on the rumour, sell on the news', Web 2.0 tools, in the form of blogs and micro blogs, are an ideal source of gossip. Through such channels of communication, consensus on trends forms. The downside of this investment decision approach is that it supports noise trading, also known as irrational speculation, where the investor speculates on the basis of trends, gossip and groundless information. [Cuthbertson & Nitzsche 2008 : 403]

It is also a perfect speculation field for potential trends emerging in the market. Here, limited time is a factor, as the speed with which trends come and go has increased, along with the likelihood that the market soon realizes that a particular stock is overvalued or undervalued, thus immediately incorporating that into its stock price. Using the trend and buzz detecting tools, such as Google Insights and categorization applications used for social networks, noise trading strategy may be applied. The risk factor of such an investing strategy is very high, due to how widespread rumours are in the web and the time that 'noise' would be an impacting factor, thus the probability of the investor ending in the negative is great.

Since the tools previously discussed demonstrate trends and tendencies, undervalued stocks are difficult to detect. This may result in missed opportunities from perspective of contrarian investing, since Web 2.0 tools detect trends on the basis of number of times it has been entered into search engine or mentioned on a social network, meaning those trends have emerged. However, if the mass selling is occurring on biased information and the stock has long term potential undetected by the herd, the opportunity is present. Therefore, the general consensus driving the market must be investigated.

5.2.3. Mood on the internet

Internet reflects its users' lives and what is happening in their lives through the updates in online social communities. According to the study on "Twitter mood predicts market", a correlation exists between the mood of the posts on Twitter and the market fluctuations. Although the method of Twitter sentiment determination used in their

research cannot be used any more due to the web application tools being no longer available, other tools can be used instead.

This is part of technical analysis and can be used to an advantage in determining the investment strategy based on market timing, which proposes to invest when the market is expected to rise, and sell when it is expected to fall.

Behavioural finance points out a number of pricing anomalies attributed to public mood. Previously discussed seasonal effects (January and Weekend effects) are often present. Other effects have been observed, such as the Weather Effect, when people have a more optimistic outlook due to sunshine outside, thus resulting in a positive index that day. The same explanation could be offered for the seasonal effects – i.e. people simply feel better before the weekend, than on a Monday; in an anticipation of holidays, people are happier; and after Christmas and New Year's, people are rested and content.[32]

Although the web application tools for identification of the mood existing today are limited, such tools as the Twitter Sentiment 140, in combination with the seasonal effects can potentially be used to determine a short-term minimal increase or decrease in stock price.

5.3. Value of Web 2.0 in choosing between investments

Web applications and social communities previously mentioned could be used in a number of ways to help decide between investments. However, it must be pointed out, that all information can be interpreted by the investor differently, and the insights Web 2.0 tools provide are no different.

Tools such as Google Insights for Search, Twitter search engine and its classification system of tweets, trends detecting applications, or any other web application tool providing insight into human behaviour, can be viewed as a detailed technical analysis. Basing trading techniques solely on such tools results in noise trading and amplified risk. However, that risk can be reduced if the time series of the trend could be indicated, meaning the turning trough or the apex of the trend could be identified. This is further discussed in short-sightedness of the market section. However it is nearly

impossible to predict when the series of upward trends or the downward trends would turn about. However, it can be somewhat indicated with the help of the Elliott Wave principle. It must be noted that this method of forecasting does not include economic factors influencing the market, but only the sentiment of the investors and their expectations.[35] Therefore, in times of severe economic crisis and unstable economies, it may be easily misinterpreted.

On the basis of the 'Twitter Predicts the Market' study and the effects described above, monitoring the mood on the internet could potentially be predicted through the use of the Elliott Wave principle. This principle proposes that the market fluctuates in the form of impulsive and corrective waves. The first consists of five subwaves moving in one direction, and the latter consists of three subwaves moving in the opposite direction, thus converging to the intrinsic value. These waves demonstrate the fluctuations of the market in accordance with Fibonacci series, since it is widely believed they reflect human psychology and technical analysis. These series demonstrate the beginning of the trend found in the market index, and its retraction in the corrective waves section.[33,34] This method is particularly useful for noise investing techniques, as it shows the probability of successful noise trading by following the waves.
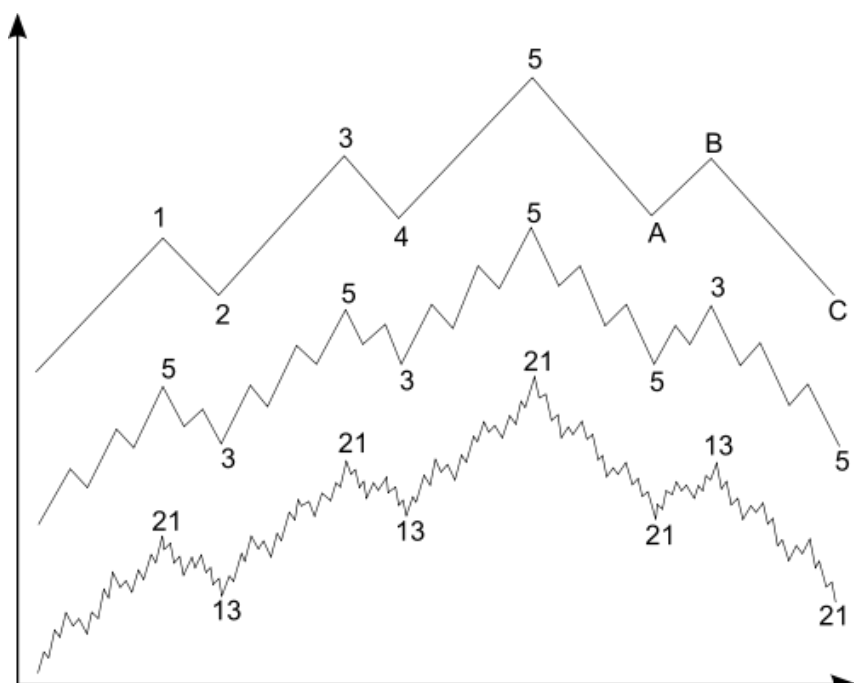
Figure 7:

Figure 7 : Elliot wave demonstrated in a bull market situation, and divided into sections according to the Fibonacci series [R.N. Elliot, "The Basis of the Wave Principle"] [35]

Through correct counting of the wave sequences and identification of the trend (upward or downward), the Elliott Wave can be used as a tool for noise trading. For example, with the help of various Web 2.0 tools, it is possible to track the opinion of a certain company, and therefore deduct whether the people are feeling positive about its securities (i.e. they are in demand) or not. This indicates the trend of the wave, whether it would be upward or downward. Then counting the waves becomes slightly easier, as an investor can indicate whether the waves are impulsive or corrective. Based on that information, the investor can noise trade on the turning points of the waves. As seen on the graph, it is easy to deduct that on the bigger waves (the upper sequences wave), the profits would be larger, and on the smaller waves, the profitability of such trades would be consequently smaller. [35]

In contrast with noise trading, through thorough investigation of the information available on the web, it is possible to acquire a mosaic of knowledge, which dictates that through various pieces of information found in different sources, a complete picture can be established. This would illustrate the gaps in the market demonstrating investors' short-sightedness in valuation of stock, due to illusion of knowledge and other factors.

6. Risks & Limitations of observing behavioural financial indicators through Web 2.0

In this section, weaknesses and risks of observing behavioural financial indicators through the tools available in Web 2.0 are discussed. There are a number of drawbacks – from an increased herding effect taking place and market bubbles occurring to investors not seeing beyond a certain horizon in the future of the company. Additionally, the Web 2.0 tools we have today are quite limited, and each investor may interpret the information differently. Therefore, being aware of the risks is vital.

The technological tools used for identification of the human factor and how it may impact the market are flawed. Particularly the web applications tools discussed in this report, since their intended design was not for financial purposes, or detection of how much of a role human behaviour plays in the market. While the market reflects all relevant information, the internet reflects all information and data possible.

For example, keyword search is quite inconsistent due to its inability to comprehend the context of the posts where that keyword is mentioned. On the other hand, tools that observe trends, look at how many times the specific keyword was mentioned in search engines' searches or the news articles published over a period of time, thus determining their popularity. The context of where the keyword is mentioned, however, is not analysed. Thus, if those trends are looked at from a graphical perspective, some of the spikes displayed cannot be attributed to the intended topic search. Therefore, any forecasts prepared through the use of such tools will most likely be inaccurate. Moreover, predicting how long the interest would remain at the high point and growing is even more complicated, since those predictions would be made on the basis of historical data.

The other major flaw is how information published on the internet, which has caught the attention of the public, increases speculation and herding behaviour. Combined with macroeconomic elements, (political, economic, social, and environmental factors), human psychology takes over and the chances of herding, irrational decision making, and noise trading increase.

6.1. Market impact amplification

The volatility of the market can be attributed to a number of factors – from world and company news to the hype formed for a particular trend, stock, or event. As previously discussed, social consensus, massively spread with the help of today's web tools (social networks and blogs) lays a strong foundation for herding behaviour occurring in the market.

John Nofsinger points out that, "Herding and overvaluation do not occur because of new economics or new technologies – they occur because of human psychology. New

economics and new technology are only the rallying cry for the herd. When overconfidence is combined with emotions, a problem results. The problem is magnified when everyone is caught up in making psychology-based decisions." [The Psychology of Investing, 2008 : 82]

6.2. Potential occurrence of market bubbles

Each emerging trend has the potential to become a market bubble. As long as the general public perceives the trend to be exceptionally valuable, without providing supporting reasoning for that belief, the trend has high potential to become a market bubble. Based on the information Web 2.0 tools are able to provide a trader with, potential market bubbles may be deduced before the general public becomes aware of it, and thus hedging the risk through futures contracts for when they burst. Web 2.0 may also serve the opposite purpose – be the base for herding behaviour occurring in trading. With social networks particularly, it is questionable whether they help detect potential market bubbles, or help fuel their manifestation.

In the preceding analysis, Facebook and Twitter were looked at as merely internet tools, ignoring that they are trends themselves with substantial buzz surrounding them. They are also multi-billion dollar valued companies.

Recently, LinkedIn went public, and now Facebook is set to soon go public as well. Its valuation is expected to be at approximately 100 billion dollars.[36] That makes its future price / earnings ratio much greater than average historical price/ratio of 16X, which would value it at around 14-15 billion dollars.[37] The high P/E ratio usually means that the stock is overpriced. However, in the case of Facebook, it is the most dominant and successful social network to date, thus holding a major market share in this industry. It is also not showing any signs that it would be leaving that post in the near future. That said, it would be interesting to observe the behaviour of Facebook if Twitter would also go public, and there are rumours that it, too, will soon follow suit.

With that information in mind, one phrase comes to mind – the Dot Com market bubble. It burst slightly over 10 years ago, and it was due to investors overvaluing the internet companies by seeing incredible potential in them. The bubble burst due to a

number of factors, with one of the major ones being that those companies simply couldn't turn to profit, and thus revealing that they were grossly overvalued and subsequently causing a market crash.[38]

When examining market bubbles, it becomes obvious that each was a trend at that time, and due to herding behaviour, everyone saw the need to invest, believing their investment would provide great returns. Before Facebook and Twitter, there were other popular social networks such as Friendster and MySpace, but they were quickly pushed out by new competition. Although the user base of Facebook is more than 3 times larger than of MySpace, it does not mean that it has won the competition. Trends, nowadays, come as fast as they go. Twitter and the recently emerged Google Plus are gaining ground fast, and their user base is growing exponentially as well.

With that said, social networks, as a whole, should not be viewed as a potential market bubble, but rather a new technological tool in the progress of the web. In contrast, the various popular social networks should be carefully watched, as they are trends themselves and thrive as long as the public holds interest in them and no new and better technological substitutes or developments are discovered.

6.3. Short-sightedness in the market

Short-sightedness occurs in the market for a number of reasons – mostly it is due to investors' foresight horizon on information. For example, investors often do not reflect the value of a commodity in the long run, if it is not obvious.

Another factor which can be attributed to investors' short-sightedness is their perspective on crisis. A crisis is a temporary phenomenon, appearing when functionality in the framework of the current circumstances is no longer possible. It presents two opportunities for a business – a chance to succeed or a chance to fail. In order to understand whether it is worth buying the seemingly bargain stock at that period of time, the level of risk one is willing to undertake is a major factor in this equation. [39]
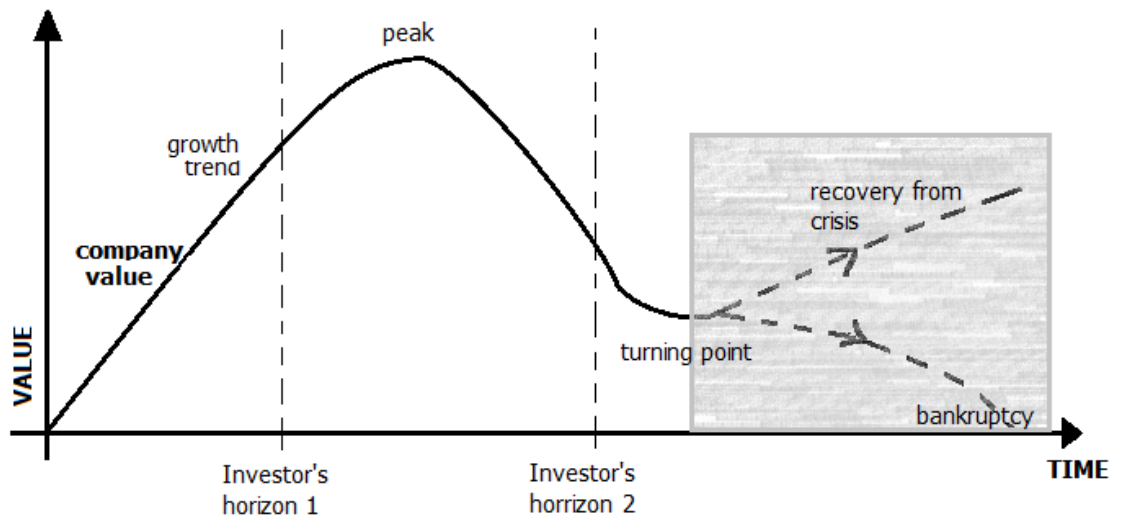
Figure 8: Company value and short-sightedness of the investors represented in graphic form

The curve above represents a typical company, which has faced a crisis of some sort and is at the turning point in its existence. Depending on the product or service the company provides and whether it has a good long-term strategy, the turning point can go two ways – recover from the crisis, or ultimately fail. In this graph, the short-sightedness of the majority of investors is displayed. While the company's value is growing, the demand for its shares stays up, due to investors' general belief that the growth will continue. If a crisis occurs, the mentality of investors changes and the stock is no longer in demand. Once again, short-sightedness is commonly displayed when the general public does not see whether the company's value will continue to fall or will recover. The grey shaded region presents the uncertainty period where a company's true potential is determined. A company with a sound long-term strategy with focus on their customers, their needs and desires can overcome the marketing myopia and keep up with the constantly changing market.[40] However, when a crisis happens, the initial reaction is panic and the future potential is overlooked.
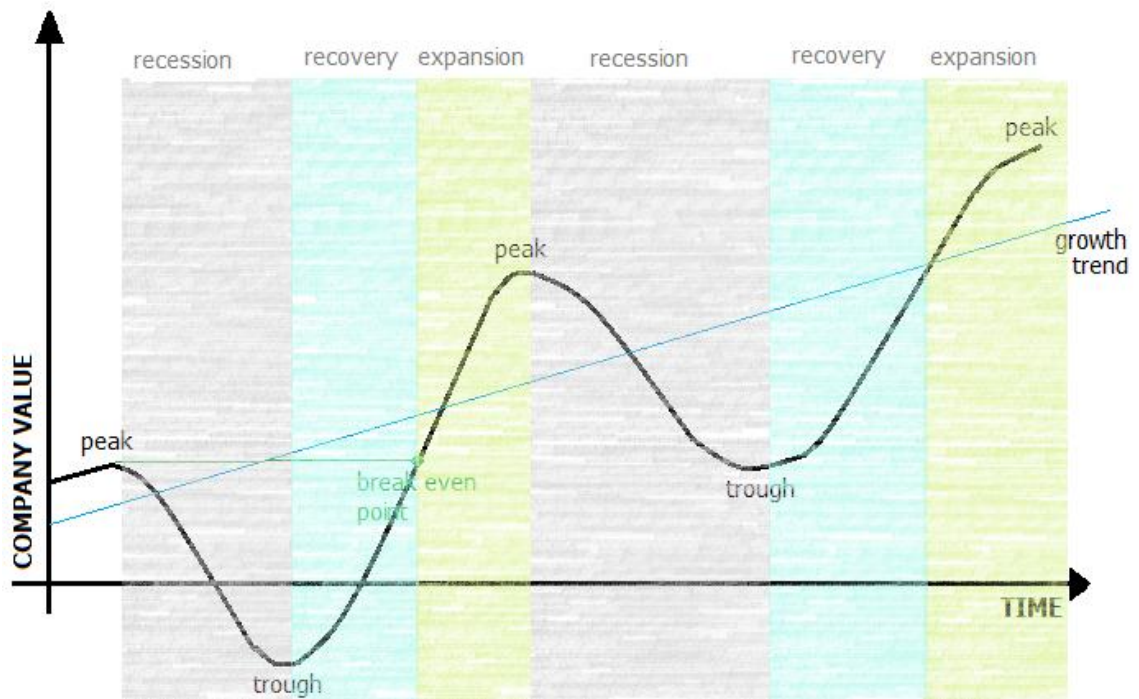
Figure 9: Graph representing the effect of business cycles on company value

The second graph displays a company's business cycles, but with the growth trend in this example. Such cyclical periods are often overlooked, and jumps in demand for the particular company's shares affect the company's stock market value as well. Short-sightedness of investors can be detected in a number of points on that graph. Theoretically, this can be used to an advantage in noise trading, which specifically focuses on trends and opinions of investors influencing the market.

Finally, the other aspect occasionally overlooked, is that some corporations have grown to such a point, that they have a substantial effect on the economy, and consequently, their failure would bear severe consequences for the a country's economy, and possibly triggering a financial crisis. Such corporations are often cited as 'too big to fail'. Thus, in the circumstances of a crisis, the general public oftentimes expect the corporation to fail entirely, and the stock price plunges due to massive selling. Factors such as the importance that corporation plays in the economy of the country/region/world, and the consequences the economy would bear are overlooked. The government may propose to bail the corporation out, or it would manage to bounce back on its own due to the importance and need of the goods or services it provides.

6.4. Risks of not using fundamental analysis

Based on the information provided in this thesis so far, it is apparent that the human factor often causes discrepancies in the market. The common consequences are overvaluation of stock, formation of market bubbles, seasonal pricing anomalies, and more. With the internet where everyone forces their opinion, the likelihood of information distortion increases with each opinion and analysis added.

Therefore, for long term investments, it is best to conduct a fundamental analysis to determine the intrinsic value of stock. Upon that analysis, elements of behavioural finance should be added to provide a more complete picture.

Through application of only behavioural finance in investment decision making, irrational speculation results, which often results in substantial losses. Noise trading may influence the market for a short period of time, but eventually, the security's price converges to its true intrinsic value. However, even with application of both fundamental and technical analysis, the prospect of beating the market cannot be guaranteed due to EMH.

7. Conclusion

Traditional finance does not provide insight into behavioural finance, and in its turn, behavioural finance cannot estimate just how much impact people's emotions may have on their decisions. The irrationality and bias in knowledge leads to manifestation of price anomalies and partial inefficiency of the market.

Throughout this thesis, a number of tools reflecting market behaviour and allowing investors to observe formation of trends and bias were mentioned. However, none of them can give a guarantee of how people will react in the market and for what duration of time.

The hypothesis has been shown to be neither conclusive nor inconclusive. On one hand, Web 2.0 is the common ground for formation of bias, herding behaviour and diffusion of information and opinion. On the other hand, the tools currently existing for the analysis and interpretation of the massive amount of information constantly posted online are flawed still. Basing investment decisions solely on the information provided by such tools as social networks, blogs, web applications and trend detecting applications leads to short-term trading based on emotion and speculation. Since the diffusion of information is viral these days, relying on the popular opinion detected in Web 2.0 tools leads to noise trading, increased pricing anomalies in the market, and potentially the creation of bubbles. However, herding behaviour, increasingly sponsored by Web 2.0 technologies, will continue to occur. Therefore, developments in the Web 2.0 should be monitored, as they can possibly provide useful insight into behavioural factors affecting non-information based market fluctuations.

Based on the analysis conducted, the market remains efficient enough, since prices of securities retract to their true value, but in the words of Warren Buffet, the self-made billionaire investor, "I'd be a bum on the street with a tin cup if the markets were always efficient."

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9. Appendixes

Appendix 1

List of some of the biggest online communities

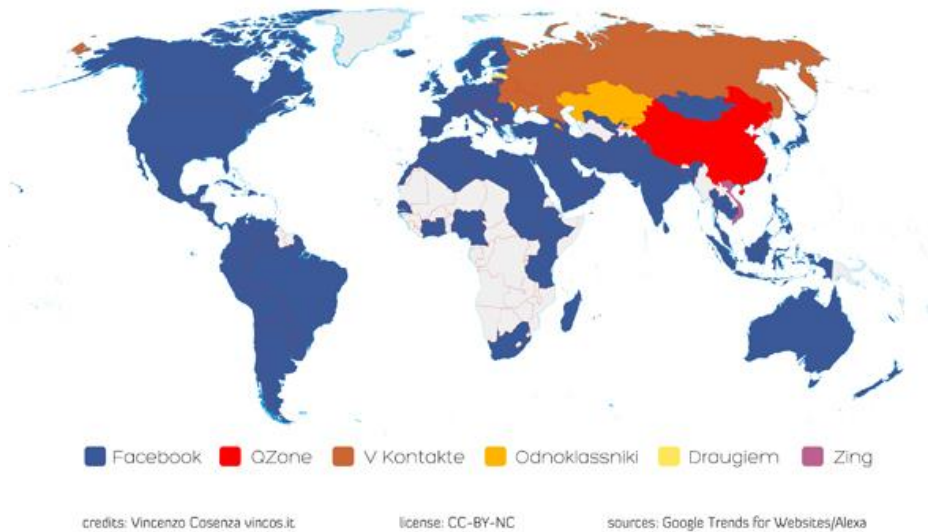| Social Network	Number of users	Source of information
Facebook	900+ million	Facebook.com
Qzone	388 million	http://www.chinasocialgames.com/?p=372
Twitter	140 million	http://blog.twitter.com/2012/03/twitter-turns-six.html
Vkontakte	170+ million	Vk.com
Google Plus	170 + million	http://www.bbc.com/news/technology-17680263

Appendix 2

Source: http://vincos.it/wp-content/uploads/2011/12/social_networks_classifica.png. The above chart shows a list of countries, where each column represents the most popular social network used. Column one is the number one choice, column two is the second choice, and column 3 represents the third most popular virtual network used. The two highlighted networks – Odnoklassniki and Vkontakte – these are the only two where the shift is happening, i.e. Vkontakte moving to the number 1 spot.

December 2011			
Countries	SNS #1	SNS #2	SNS #3
Australia	Facebook	LinkedIn	Twitter
Austria	Facebook	Badoo	Twitter
Belgium	Facebook	Badoo	Linkedin
Brazil	Facebook	Orkut	Badoo
Canada	Facebook	LinkedIn	Twitter
Denmark	Facebook	LinkedIn	Badoo
Finland	Facebook	LinkedIn	Twitter
France	Facebook	Badoo	Skyrock
Germany	Facebook	Wer-kennt-wen	StayFriends
India	Facebook	Orkut	Twitter
Italy	Facebook	Badoo	Twitter
Japan	Facebook	Mixi	Twitter
Netherlands	Facebook	Hyves	Twitter
Norway	Facebook	LinkedIn	Twitter
Portugal	Facebook	Orkut	Linkedin
Sweden	Facebook	LinkedIn	Twitter
Russia	Odnoklassniki	V Kontakte	Facebook
Spain	Facebook	Tuenti	Badoo
United Kingdom	Facebook	Twitter	Linkedin
United States	Facebook	Twitter	Linkedin

WORLD MAP OF SOCIAL NETWORKS
December 2011

■ Facebook   ■ QZone   ■ V Kontakte   ■ Odnoklassniki   ■ Draugiem   ■ Zing

credits: Vincenzo Cosenza vincos.it   license: CC-BY-NC   sources: Google Trends for Websites/Alexa

This map shows the coverage of social networks, and points out which is the most popular across the different corners of the world. (Source: http://vincos.it/world-map-of-social-networks/).

Appendix 3

Facebook

Facebook is probably the most widely known social network with the most active users, with nearly 834 million using the website monthly, and 483 million daily active users.[17] Its design facilitates the spread of information and opinions. Therefore, it is an excellent base for formation of bias.

Although the social network has been banned a number of times throughout countries such as Bangladesh (May 2010 for 1 week), Syria (official yet inefficient ban as the firewall is easily overcome), Iran (150 thousand registered members, yet by law the website is restricted), and most famously – China (which surprisingly has nearly half a million registered members[18]), it is still regarded as the number one social networking website.[19] Therefore, it is safe to assume that Facebook absorbs a variety of opinion influenced by various cultures. Appendix 2 demonstrates the global coverage of Facebook.

Looking at a person's profile on Facebook, it is easy to gather enough information for basic profiling. When doing the same for a social networking page of a company or a brand, the insight is even bigger. People that 'like' the page of a particular business,

are usually either fans or consumers of that particular brand, and many of them tend to comment when seeing what they like or dislike, give their general opinion, criticism, and suggestions. In these sections, it is possible to observe how the public, although only a fraction of the consumers, feel about it.

The difficulty with this social network is the restrictions posed through what information is visible to other people. For example, to conduct a quick basic overview of the majority of most recent messages in regard to one topic is impossible, since many people post updates visible only to their circle of friends. Unlike Twitter, there are not many analytical and categorizing tools available for any Facebook user to research what is being about their topic of interest.

The Web 2.0 tools affiliated with Facebook are not looked into in this thesis for one main reason. Facebook does not have a categorization or a search engine tool which would enable a user to track a specific keyword or a specific topic throughout all its groups and pages. Each has to be viewed separately, and due to a large number of groups being created on the same subject, the task becomes increasingly inefficient and difficult. However, recent developments now show on a 'fan page' how many people are talking about the topic. [Facebook website 2012]

Twitter

This micro-blogging social networking website, in essence, is very similar to Facebook, except for some of its elements. Its design is entirely different. Here, the only update and communication can be done through an update, called 'tweet', of 140 characters or less. Thus, oftentimes, links are provided to external websites, connecting a reader with information. Another feature is that users can easily connect with any person they would like, whether or not they know them personally. Then, all that is posted by people they are 'following' or are subscribed to, is displayed in their feed.

One of its most useful features is the visibility of the posts online, and the categorization of those posts. While in Facebook, any one person cannot see the information another user has posted on their page until they are connected to them, this is not necessary for Twitter. There is also an automatic categorization tool used to see other users' opinion on a topic of interest. This categorization occurs either through the use of a hash sign and the topic name, or through the use of keywords.

This works on the same principle as with search engines, with one slight adjustment – the keywords are not written into meta tag, but instead, are visible in the tweet.[20]
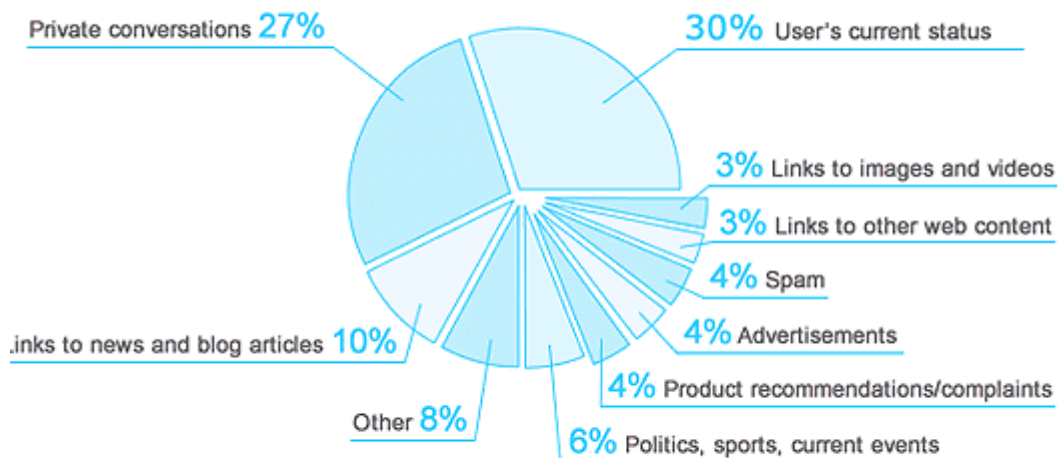
When searching for a topic of interest through Twitter's search, posts are categorized into three types:

- Top tweets – determined by an algorithm which selects them based on the attention is has attracted
- Promoted tweets – paid posts for an increased visibility of the user's tweet
- All tweets – all posts from all users mentioning the keyword entered into the search, sorted in the order as they are posted.

Extracts provided below demonstrate the just published posts for that moment on a topic of interest in Top Tweets and All Tweets sections, revealing the difference in information the Twitter's search engine provides.

The beauty of this categorization lies in the help it offers – one can get good insight on the current events of a company or industry, as well as gather general sentiment on that topic. One downside of it, is the speed and the amount the posts keep coming, both in top tweets, and even more so in 'all tweets' section. Within 5 minutes, a hundred of new posts were added into each section. The quality of information also suffers due to numerous spam posts. The following extract from Twitter facts and figures demonstrates the varying types of messages posted on the social network.

Twitter message types

Private conversations 27%
30% User's current status
3% Links to images and videos
3% Links to other web content
4% Spam
4% Advertisements
4% Product recommendations/complaints
6% Politics, sports, current events
Other 8%
.inks to news and blog articles 10%

The highest spam level - almost 11% of Tweets was noted in August 2009.

Figure 4: Topic category distribution of tweets/updates posted on Twitter[21]

The above information on the types of tweets, teamed together with the some latest figures poses a problem. As of March 11th of 2011, there are approximately 177 million tweets posted *daily*, and that is a 26.4% increase in 1 *month.* There are approximately half a million new accounts created *daily.*[22] The most obvious issue is caused by processing capability of the new information posted by users, as these numbers continue to grow stratospherically. It is also a double sided coin. As the number of participants increases, a better picture of the web's sentiment is reflected.

The recent application of Twitter's updates and the information it portrays will be looked at in the Web Moods section. A study has been concluding that the mood of Twitter updates reflect the 'random walk' seen in stock markets.

Examples of Twitter Search Categorization

For example, if one is interested in what is going on in the industry of smartphones, the following keyword has been entered into the Twitter search engine – "smartphone". Here are the results for comparison between the Top tweets and all tweets section.

Source: Twitter.com. Keyword: Smartphone

The chart below demonstrates the distribution between the content types of all tweets on Twitter.

Source: http://www.digitalbuzzblog.com/social-media-statistics-stats-2012-infographic/
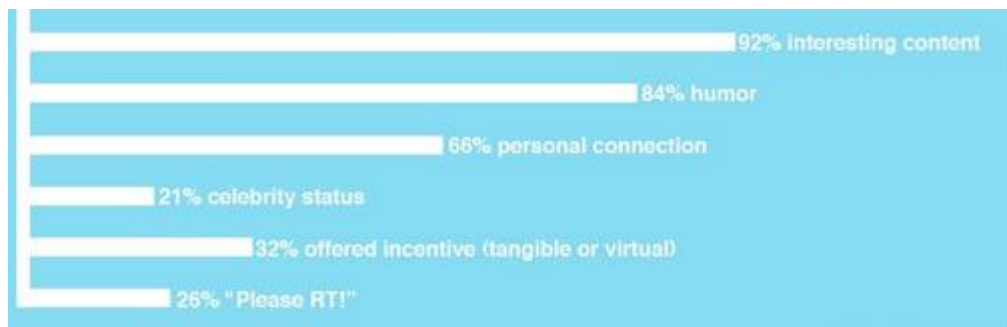
Appendix 4

Here is the Twitter sentiment analysis tool extract. It is the only sentiment analytical application available at the moment, since the tools used in the "Twitter Mood Predicts Stock Market" study are no longer available.

Tweets about: apple

PacManP: Not far from the tree that's where the apple fall
Posted 25 seconds ago

iHave__NoSENSE: I want some apple juice..
Posted 25 seconds ago

Bayylayyy: I want a Carmel apple??
Posted 30 seconds ago

YoungHRLM: Apple to Launch Affordable Line of iPad Minis in Late 2012
Posted 47 seconds ago

Excuse_My_Finch: He fucked up apple pie for me real shyt! I cant believe he said that
Posted 48 seconds ago

NikTuhk: @Cbearsmamma you guessed it WRONG! Made a new apple id, all my apps I downloaded with the old one won't update! Fucken iPhones!
Posted 50 seconds ago

Freezure: @ios_minecraft so, can you personally email apple to approve it faster? :)
Posted 1 minute ago

CapnClaire: @meowitslily lol orange juice?! apple juice is better lol
Posted 1 minute ago

sikeyourmuli: "@_TiaSimplyDGAF: Candy Apple - Uce Duce <--- This Shit STILL Slap"except for the part where we only know the chorus!d;P lmao!!!
Posted 1 minute ago

nessaDiamondz: "@WhoisLinux: @nessaDiamondz *hands you the apple*" * takes a monster bite and smiles with full cheeks*
Posted 1 minute ago

PetiteAndSweet_: @I_GetMInes lol I just got some more apple juice so ill drink that
Posted 1 minute ago

NikTuhk: @Cbearsmamma ya it really sucked. Then my apple id wouldn't work. Password was wrong, tried my bday, it was wrong, my secret question yep
Posted 1 minute ago

ItsGiankaLGF: @Juleidys if its the first time you know they replace it for free at the apple store right??
Posted 1 minute ago

andreamd: A bottle of apple sourz and champagne = best birthday ever, thanks @benfitter
Posted 1 minute ago

BaseEm_BITCH: Im so PISSED my bruva drunk some of my apple juice & its only a lil bit left little dirty BITCH. Dats why I been drinkin out of it all day
Posted 1 minute ago

fuckyoukaela: just killed a bug with my MacBook. I care deeply about my apple products.
Posted 1 minute ago

i_am_Mattieee: @tapbot_paul are people really that stupid? Apple would never approve of an android lock app.
Posted 1 minute ago

THEemilywood: Just cut my finger on an apple slicer #ouch
Posted 1 minute ago

larissademerais: Omfg I fucking hate how this corrects you. Fuuckkk you apple you're making me look retarded
Posted 1 minute ago

momebie: @earlofcardigans I had an apple with peanut butter and some orange juice. We have both succeeded!
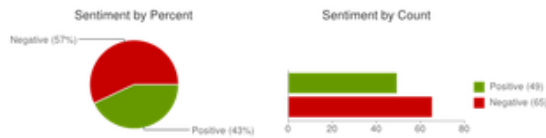Posted 1 minute ago

IceColdIke: I love apple juice
Posted 1 minute ago

BaldBrownBOLD: Apple-cinnamon Cake and coffee with friends :)
Posted 1 minute ago

An extract from 140sentiment.com, which determines the mood of the public based on the feed of the tweets. The searched keyword used is "Apple". From The results given, it is obvious that keywords have to be more specific. Also, this tool cannot always interpret the meaning of the posts. An adjusted search on 'Iphone' is shown below. The problem with interpreting some messages still persists, but relevant tweets are displayed.

Sentiment analysis for iphone

Sentiment by Percent   Sentiment by Count

Negative (57%)

Positive (43%)

Positive (49)
Negative (65)

0   20   40   60   80

Tweets about: iphone

Razanalsayed: Free available Awesome tvQuran App for **iphone** in Apple store. Posted 24 seconds ago
justin_sturman: When my **iPhone** sends an email the sound makes me feel like I'm in space! Posted 26 seconds ago
parvana_x: @AneesahAziz join the crew Aneesah,nothing can beat the love for an **iPhone** Posted 41 seconds ago
jarrodbooth: Between @tunein and @tweetbot I fukken love my **iPhone** Posted 49 seconds ago
paulfraserecho: @HuddoHudson haha. Yeah, couldn't blow it up on my **iPhone** tho. Well chosen pic ;) we are all out on work night on may 19!! Posted 51 seconds ago
Mr2_3Zone: Man I can't help but stay on my **#iPhone** Posted 1 minute ago
krystalatwork: At Starbucks, and realized I forgot my laptop charger, **iPhone** USB cable, and headphones at home. Awesome. #lifeofafreelancer Posted 1 minute ago
jestalani08: @katweenaE im using **iphone** too cra! Mas okay ang twitter ng **iphone** bb's twitter is acting weird late ang noti ng mga mentions.. Posted 1 minute ago
AneesahAziz: mdays, im officially on th **iphone** hype. Cant wait to see my dad & tell him :L Posted 1 minute ago
Reem_Rumble: "@sharise_: MY PHONE IS REDIC ! I NEED MY **IPHONE** BACK FOR REAL FOR REAL!"awwww Posted 1 minute ago
bandw_eventing: @RichieEames haha no it was my **iPhone** and I couldn't hold it up as I kicked on. The horse is a doll though :-) Posted 1 minute ago
CalebWilliams24: You should be able to use iTunes visualizer on the **iPhone** (period). Posted 1 minute ago
GCHarris91: @LaceeDyer I'm guessing if u google instagram it should take u 2 the main site, but if u ain't got an **iPhone** it's not worth it Posted 1 minute ago