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# Can Social Media Content Increase Financial Market Returns? Survey Results from Poland

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**Background and Purpose:** In recent years classic financial market theory based on decision makers' rationality has been challenged by repeated anomalies that became a 'new normal'. As a result, what we witness today is a considerable turn to behavioral concepts that can shed a new light on choices made by market participants. The astonishing development of social media accelerated scientific validation of such concepts, since the media opened new and capacious 'laboratory space' for testing behavioral hypotheses. The main purpose of the article is to examine whether financial market professionals believe that social media content can be useful in achieving additional financial market returns and to investigate the factors behind this belief.

**Design/Methodology/Approach:** We surveyed a sample of over 400 financial market professionals at institutions operating in Poland, and analyzed the results using logit regression models.

**Results:** We established that almost 60% of the surveyed finance professionals recognized the potential of social media for achieving additional returns. We also found out that the differences in respondents' perception of this potential could be explained mainly by heterogeneity of their job experience and, to a lesser degree, by their job position. Interestingly, more experienced individuals were less likely to recognize this potential. Firm-specific factors did not have a significant effect on the dependent variable.

**Conclusion:** The opinions of financial market professionals regarding the link between social media and additional returns are mixed, which is consistent with the current body of evidence brought by sentiment-based research. Our findings confirm the key role of previous experience in explaining attitudes towards novelties and innovations (such as social media), a phenomenon known from other fields and everyday experience.

**Keywords:** *social media; sentiment; behavioral finance; financial market professionals; financial market returns*

## 1 Introduction

Decisions must be informed. This is true also about investment decisions in financial assets. Traditional financial market theory, based on the efficient market hypothesis (hereafter EMH), assumes that stock prices reflect all publicly available information. Consequently, according to the most broadly accepted semi-strong form of EMH, market prices of securities fluctuate randomly as they are driven by unpredictable news releases that are instantly discounted in the prices (Fama, 1970; Fama, 1991). As a result, one cannot outperform the market relying on widely known

information. Moreover, in the light of the classic theory, accurate prediction of stock market movement and future stock returns is questionable. Interestingly, there is empirical evidence that contradicts such a view (Kahneman and Tversky, 1979; De Bondt, 2003). Gathered particularly during the time of market excesses (such as the Internet bubble or the recent sub-prime crisis), it refers to phenomena commonly known as anomalies. This mismatch of theoretical predictions and empirical observations still poses a challenge both for academics and practitioners.

The debate over this disparity concentrates on controversies around the rationality of investors' behavior EMH

is built on. It assumes that market participants' decisions are aimed at own utility maximization and fact-anchored. What is behind them is just reasoning. There is no room for feelings, and, more broadly, for psychological decision-making drivers, as the human individual is considered *homo oeconomicus* – an unemotional agent.

The advent of social media about a decade ago turned out to be a vital factor for the intellectual dispute concerning the issue. Although the existing literature defines social media in various ways, all definitions point out the fact that it can be useful as a supplementary source of information for business participants. Generally, this media can be perceived as Web 2.0-based services allowing for content sharing. Some previous studies proved that social networks can be an additional source of unofficial, yet useful and value-relevant information. For example, social media facilitate the exchange of private and informal earnings forecasts among traders, a phenomenon pointed out by Bagnoli et al. (1999) even before the age of social media. Moreover, user-generated content is primarily textual, which means that it is more qualitative than quantitative by nature, and some studies proved that such content may not be fully and immediately incorporated into the market pricing mechanism (Tetlock et al., 2008). Additionally, and possibly more importantly, the proliferation of social media gave boost to behavioral finance with its broad arsenal of new, potentially value-relevant factors not included in classic financial market theory.

By referring to the achievements of psychology, financial behaviorists hypothesized that in order to fully explain the forces underlying investment decisions, hence price movements, and – ultimately – to predict future financial market returns, one must break away from the rationality assumption. This claim was supported by rich empirical psychological evidence, readily cited in economic and financial literature (e.g. Okada and Yamasaki, 2014). Consequently, behavioral finance enabled the inclusion of market participants' sentiment – an obviously irrational, emotion-driven factor – in the framework in which investors' decisions are considered. Since sentiment is not directly observable or easily measurable, it must be extracted from textual content. This can justify relatively short history of empirical research in this field, as they started in the late 1980s and early 1990s. Currently, the progress of computational intelligence, which accompanied the emergence and rapid growth of social media space in the Internet, enables incomparably more effective analyses of a high volume of user-generated content. Thus, the incorporation of sentiment and other measures of social media user activity into models explaining and

predicting financial market returns, made possible as a result of big data mining technology, can significantly contribute to outstanding performance in this domain. Despite the above mentioned short history of empirical research, the body of evidence in this field is vast, yet inconclusive. However, Baker and Wurgler (2007, p. 130) aptly observe that '[n]ow, the question is no longer, as it was a few decades ago, whether investor sentiment affects stock prices, but rather how to measure investor sentiment and quantify its effects'. Some latest studies even suggest that social media can outperform other sources of signals potentially useful for investors in predicting financial market returns (e.g. Hu and Tripathi, 2016).

Motivated by such findings, we decided to check the extent to which financial market professionals in Poland perceive social media content as useful, mainly in terms of opportunities to earn additional returns on financial assets (hereafter, in short, additional returns). Drawing on the sentiment analysis literature, we hypothesized that their interest in social media is significant and so is their use of this media for information provision purposes, and hence for achieving additional returns. To verify this, we surveyed a sample of 415 financial market professionals working in Poland and analyzed their responses using logit regression models to gain an insight into the significance of social media for earning additional returns. Specifically, we designed our study to acquire a better understanding of the issues underlying the following questions: (1) does financial community perceive the potential hidden in social media for earning additional returns, and (2) what is the community's demand for business intelligence platforms powered by social media content and fueled by big data technology?

Our findings can have sound positive as well as normative implications. Positive, because they picture contemporary situation in terms of information feed of financial market professionals. Normative, since they can serve as a basis for various recommendations concerning potentially beneficial enhancements in the market for such information, including placement of new products on the market. Finally, they can shed additional light on the possibilities of strengthening the efficiency of financial markets. As this is the first study of financial market professionals in terms of their openness to social media content in Poland and, to the best of our knowledge, in the entire region of Central and Eastern Europe, it can significantly contribute to the existing body of evidence concerning the information needs of financial institutions.

The next section of the paper provides a review of the literature devoted to information requirements of financial market professionals, with the focus on

the role of Internet sources in general, and social media in particular. In this part, we confront two issues that are pivotal for the formulation of valid concluding remarks: the way financial market professionals perceive social media as an information source as reflected in its prevalence in the industry, and the potential hidden in this media as reflected in its power to explain and predict financial market returns. This is followed by the methodological part, in which we provide details regarding the survey and applied models. We proceed to demonstrate and discuss the empirical results of the study, and to sum up the key points of the paper.

## 2 Literature review

### 2.1 The prevalence of social media in professional investment community

The significance of traditional information sources, such as all forms of company disclosures (including financial statements, management commentaries and company website news), press and other traditional media releases, or professional publications (surveys, reports, analyses, recommendations, etc.), is well-documented in the existing literature. Over the last decade, they were gradually supplemented with social media represented by various types of Internet platforms (social networks, blogs and microblogs, discussion forums, wikis, video-sharing portals, etc.). Interestingly, according to GNIP (2014) – a leading global provider of social data – the embrace of social media data by financial industry is delayed approximately three years compared to pioneering brand industry; the current use of social media by finance professionals approaches the inflection point of an S-shaped curve that is typical for innovations, and we will soon observe its acceleration. However, this delay can be easily explained by regulatory concerns and should not be perceived negatively (Chanda and Zaorski, 2013). Business usage of social media content by financial market professionals manifests itself primarily in its adoption as a communication channel, and – what is critical for the objectives of our article – as an alternative source of data, information, and even knowledge.

GNIP white paper on social media in financial markets (2014) maintains that 2013 will be remembered as a breakthrough for the industry, at least in the United States. On the one hand, the US Securities and Exchange Commission ultimately approved the use of social media by companies to publicize information important for market participants. On the other, social media for the first time proved their power in forcing the market to massive movements (e.g. the Hash Crash following a message from the hacked Associated Press's Twitter account in April 2013,

and tweets of the renowned investor Carl Icahn concerning the value of Apple). Since the beginning of the current decade, the published results of several surveys shed a light on the role of social media in supplying financial market professionals with the information that is relevant to investment decisions (Bowles, 2010; DVFA – IR Club, 2015; Greenwich Associates, 2015). These early studies seem to confirm that what we witness today is just a dawn of social media activation in the financial services sector.

In the presentation for City Week in September 2010, Thomson Reuters demonstrated key findings of some recent research in the field (Bowles, 2010). They were as follows: 89% of financial market professionals admitted that they were social media users (59% on at least a weekly basis), also for reasons related to their occupation. However, only 10% stated that they used social media mostly for professional purposes, and merely 1% – solely for such purposes. Intriguingly, although networks, wikis and video-sharing were found to be the most popular in the entire sample of social media users, it was blog (including microblog) that was the most frequently selected social media by those who consumed its content primarily or exclusively for professional reasons.

In the summer of 2013, the Society of Investment Professionals in Germany (DVFA) and the Investor Relations Community (IR Club) surveyed 121 European representatives of investment professionals, mainly from Germany (DVFA – IR Club, 2015). The researchers found out that interest in social media as a means of meeting information needs was at best moderate. 50% of the respondents rated social media at least partly important, yet all other possible sources offered for selection were reported more important compared to social media. Not surprisingly, the issuer of a security was considered the most valuable source of information, an observation confirmed by many other studies, concerning also retail (individual) investors (e.g. SII, 2015 in Poland). What is important, for 28% of the respondents social media gained in significance over previous years. However, the gain of other information sources was even greater.

At the end of 2014 Greenwich Associates (2015) surveyed 256 institutional investors from Europe, Asia Pacific region and the USA to establish the role of social media in their daily business. According to the study, in almost all included firms (97%) digital media were used for investment decision-making purposes, while 79% of respondents reported that they used social media in this field (these two categories of media were separated in the questionnaire). The survey also revealed that social media content has a behavioral impact on financial market professionals in the sense that it serves as a trigger for various actions and initiatives. A remarkable proportion of respondents (48%) admitted carrying out further research motivated by what they had found in social media. 37% of the entire sample shared such information with the decision makers in their

institutions, while 31% had been prompted by the information to make an investment decision or recommendation. About 55% of respondents thought that the usage of social networks would stay the same over the next year, while approximately 40% believed it would rise.

To recapitulate, although evidence shows that social media are already monitored by financial market professionals for informational purposes and induce some corporate actions, the attitude of financial industry towards social media is one of caution and wariness, as reflected not only in their prevalence, but also intensity of usage.

## 2.2 Sentiment analysis literature

The business potential of social media has been quickly recognized by the corporate sector, as it creates an unprecedented opportunity to learn and track opinions of a vast number of people on products, brands, corporate actions, etc. at a reasonable cost and on a real-time basis. Such knowledge can obviously help to outpace the competition. Sentiment that can be learnt from social media seems to be particularly significant for financial and, even more so, stock market professionals, since the market is outstandingly prone to the impact of ‘animal spirit’. The key findings – both theoretical and practical – in the field of market sentiment and stock pricing before the age of social networks were comprehensively reviewed by Baker and Wurgler (2007), hence we focus here on the rapidly growing body of works that emerged since their paper was published. In fact, this evidence is of pivotal significance as it builds on the examination of the most prominent and revolutionary social networking platforms that had been launched just before Baker and Wurgler’s article (LinkedIn – 2003, Facebook – 2004, Twitter – 2006). Nonetheless, we begin with a brief outline of the achievements of those researchers who extracted sentiment from traditional (media news, including online, and newswires) or hybrid media (message boards). This is followed by a presentation of the latest studies focused on social media, particularly Twitter.

The literature on the role of market sentiment in explaining stock returns is quite varied in many respects. Firstly, some researchers have tried to find associations between these two variables, while others strived to confirm the predictive power of sentiment for stock market phenomena, particularly returns. Secondly, in their search for irrefutable empirical evidence, they have tested various variables: not only sentiment, but also message volume and disagreement among posted messages as the key social media characteristics on the one hand, and returns, trade volume and volatility as prime stock market parameters on the other. Thirdly, their studies have applied a variety of measures to gauge sentiment (generally, they can be divided into ones relying on traditional, i.e. dictionary-based approaches and those using natural language

processing (hereafter NLP) / machine learning approaches derived from computer science). Fourthly, the studies have been based on different methodological assumptions (models used, individual vs. aggregate data, etc.). Finally, they have investigated a broad range of media, from newspaper coverage through microblogs.

Rigorous and theoretically well-grounded studies of market sentiment as a potential driver of stock returns go back to Cutler et al. (1989), who extracted sentiment from news stories (*The Wall Street Journal*). This strand of empirical literature revolving around the content of newspaper stories is represented by later groundbreaking works by Tetlock (2007) and Tetlock et al. (2008). Some authors of this stream look for research material in the distant past. For example, Campbell et al. (2012) investigate the role of news media in stock prices during the British railway mania of 1840. In Japan, Okada and Yamasaki (2014) demonstrate that mid-year stock market return seasonality as reflected in the saying ‘sell in May and go away’ is almost perfectly associated with the sentiment proxy they adapted and extracted from Japanese media news. The most recent studies mine not only online newspapers columns, but also the most influential newswires such as Dow Jones, Thomson Reuters, and Google Finance (Heston and Sinha, 2014, Chouliaras, 2015, Hu and Tripathi, 2016).

Another stream of research investigates online message boards created for stock market participants (Yahoo!Finance and Raging Bull were the most often scrutinized). It is represented by such authors as Wysocki (1998), Tumarkin and Whitelaw (2001), and Dewally (2003) who studied easily measurable characteristics of message boards, such as message volume and user ratings, as well as by those conducting sentiment-based analyses: Antweiler and Frank (2004), Bissattini and Christodoulu (2013), Kim and Kim (2014). Although their findings are inconclusive, they are promising in terms of the association between market sentiment and key stock market parameters.

The advent of social networking platforms in the first decade of the twenty-first century created another, potentially fruitful avenue for researchers testing the relevance of market sentiment in explaining stock returns. This resulted in a series of papers aiming to ascertain whether the content of Twitter – the most relevant social network for such studies – can move the stock market. This stream of research is represented by such works as Sprenger and Wulpe (2010), Ruiz et al. (2012), and Zheludev et al. (2014). Bollen et al. (2010) point out the fact that sentiment has many dimensions and only some of them have predictive power for stock returns. Yang et al. (2014) demonstrate that filtering out the finance community from Twitter community as a whole is of key importance for successful Twitter-based sentiment analysis. They prove that the sentiment extracted from posts attached to critical nodes of the ‘finance community’ network is more closely associated with stock returns and volatility than the one ex-



tracted from ‘entire community’ posts. Additionally, some researchers test, with promising results, the effectiveness of social media-based trading strategies or platforms capturing sentiment-driven investment opportunities (e.g. Davda and Mittal, 2008; Ruiz et al., 2012).

In the light of the diversity of methodological frameworks, it is not surprising that the current body of evidence in the field of social media sentiment effect on stock market movements is far from consensus. For example, Sprenger and Wulpe (2010), Chen et al. (2013), and Heston and Sinha (2014) prove that social media-extracted sentiment matters for stock prices. By contrast, Antweiler and Frank (2004) and Kim and Kim (2012) find no support for the hypothesis that the sentiment of social media messages contains financially relevant information in terms of its association with stock returns. Interestingly, Hu and Tripathi (2016) obtain results that lend support for the value relevance of sentiment extracted from stock forums, as opposed to media news platforms. The study is revealing as its findings implicate the presumable superiority of social media over other types of media, including online, in conveying sentiment signals potentially leading to additional market returns. The authors convincingly argue that this can be explained mainly by faster diffusion of opinions through social media compared to traditional media outlets. Moreover, they established that the two proxies of sentiment – extracted from the examined Internet forum (HotCopper) and media news platform (Google Finance) – are not correlated, which implies that both include unique content.

To sum up, the empirical literature devoted to the relationship between user sentiment as reflected in the postings on social media and stock market performance is abundant, basically inconclusive, and only partly supports the behavioral finance hypothesis according to which the sentiment can not only explain but also predict stock returns, at least to a degree (i.e. in relation to some asset classes, time windows, and social media users’ messages).

### 3 Methodology

#### 3.1 Survey design

Our research consisted of two parts: a survey study and regression analysis. In the first step, we designed a questionnaire (see Appendix for details) consisting of two broad parts: eleven questions concerning the informational needs of respondents (the main part) and seven questions to determine the respondents’ particulars. All questions were semi-closed, i.e. the respondents were provided with a range of answers they could select, but they could also add their own options to the list. In a sense, the main part of the questionnaire had a dual structure since the questions from 1 through 3 concerned informational needs in

general, while the remaining ones focused on social media. Since our aim was to achieve a number of research objectives in one survey, we refer here only to those questions that served the purposes of the present article.

We surveyed financial market professionals to gain knowledge on the following issues:

1. their opinions as to the usefulness of social media in achieving additional returns (Q6: ‘Do you think that monitoring social media content can result in additional returns?’),
2. required signals conveyed in social media content (Q7: ‘What would you like to extract from social media content for your job purposes?’),
3. interest in an IT solution helping to use social media content to earn additional returns (Q8: ‘Would you like to have software allowing for real-time monitoring of internet media, including social media, and converting its content into numbers, such as a proxy of market sentiment?’).

The premise behind the question concerning the perceived usefulness of social media (Q6) was empirical evidence established by some sentiment analysis-oriented researchers suggesting that social media monitoring can pay off (Chen et al., 2013; Heston and Sinha, 2014). We decided to complement it with queries regarding the exact content of social media financial professionals would be interested in (Q7) and their interest in acquiring social media-fitted software allowing for the extraction of such content (Q8), as these issues were not covered by prior surveys (Bowles, 2010; Greenwich Associates, 2015; DVFA – IR Club, 2015).

We fielded the questionnaire-based survey between April 25 and June 6, 2016. The data was collected using the Computer-Assisted Telephone Interview (CATI) technique among a sample of 415 financial market professionals working in financial market institutions in Poland. We partnered with a professional market research institute to conduct the survey. The sampling process used Standard Industrial Classification (SIC) codes and the Financial Supervision Authority classification to obtain data on the financial institutions active in Poland. This approach was selected because of the inability to run a random sampling procedure (it is very difficult to gather comprehensive data on finance-related firms in Poland as many of them are small businesses with highly diversified services). Sentiment analysis literature suggests that social media content can be particularly interesting for those who invest in financial assets or recommend investment choices. As a result, we decided to remove the institutions not engaged in investment decisions from our database used in further analyses.

The distribution of the respondents’ characteristics shows that our sample was skewed to universal banks (with a capital market department within their structure),

which had a 25% share in the total sample. This is consistent with the prevalence of commercial banks (including their branches) in the entire number of financial institutions active in Poland. According to job position, the largest group included directors and managers (36%), followed by executives (17%) and owners (16%). This means that our sample was dominated by decision makers, who collectively amounted to almost 70%. We found a contrast regarding the respondents' period of experience in asset management or business analytics: for 42% of the sample it was at most 1 year, whereas for 26% it exceeded 10 years. What is also important is that about half of the respondents refused to indicate the value of assets managed by the entity for which they worked (a notable proportion – 25% – reported no managed assets due to the specific nature of the line of business they represented).

### 3.2 Regression analysis design

We used the following models to explain the variance of replies to the question whether the information published in social media may be a source of additional rate of return ( $Y_i$ ), which take the following values for an  $i$ -th respondent:

$$Y_i = \begin{cases} 1 & \text{if a respondent perceives the information published in social media} \\ & \text{as a source of additional rate of return} \\ 0 & \text{otherwise} \end{cases}$$

Since the variables are nominal, logit models were used. A binary choice logit model takes the following form (Greene, 2002, p. 667):

$$P(Y_i = 1|\mathbf{m}) = \Lambda(\mathbf{m}'\boldsymbol{\alpha}) = \frac{\exp(\mathbf{m}'\boldsymbol{\alpha})}{1 + \exp(\mathbf{m}'\boldsymbol{\alpha})} \quad (1)$$

where  $\Lambda$  is a logistic cumulative distribution function,  $\mathbf{m}$  is a vector of explanatory variables,  $\boldsymbol{\alpha}$  is a vector of parameters, and surveyed individuals. Vector  $\mathbf{m}$  contains the basic characteristics of surveyed professionals and institutions they represent (respondent-specific and firm-specific variables), as well as additional variables that will describe possible spatial patterns and the respondents' perception of 'information'.

To test for the statistical significance of the whole set of variables, we used a likelihood ratio (LR) test which has a  $\chi^2$  distribution with  $k$  degrees of freedom, where  $k$  is the number of explanatory variables. We calculated the variance inflation factor (VIF) for each variable. We eliminated (imperfectly) collinear variables, most often selecting them as benchmarks. The results confirm that there was no significant correlation between the explanatory variables.

For analytical clarity, we distinguished the following groups of independent variables: (1) respondent-specific variables (e.g. job position and experience), (2) firm-specific variables, i.e. factors characterizing the institutions represented by the respondents (e.g. firm type and the val-

ue of assets under the firm's management), and (3) other variables, i.e. the replies to two initial queries of the questionnaire (Q1 and Q2). The applied respondent-specific variables included: (1a) general experience in stock exchange analysis / asset management (variable denoted as *exp\_general*), (1b) job position (a set of variables denoted as follows: *occup\_analyst* – analysts; *occup\_executive* – executives; *occup\_specialist* – specialists; *occup\_broker* – brokers; *occup\_findir* – CFO; *occup\_owner* – owners; *occup\_other* – other job positions), and (1c) practice in the current job position (variable denoted as *exp\_occup*). We adapted the following firm-specific variables: (2a) firm type (a set of variables denoted as: *firm\_fund* – various types of funds; *firm\_house* – brokerage houses; *firm\_insurer* – insurance firms; *firm\_advisory* – advisory firms; *firm\_ubank* – universal banks (with capital market departments); *firm\_broker* – other brokerage activity; *firm\_othersfin* – other financial institutions; *firm\_other* – other firms, not classified elsewhere), (2b) the value of assets managed by the firm (variable denoted as *asset\_value*), (2c) diversification of the assets (variable denoted as *asset\_number*), (2d) risk of the assets (variable denoted as *asset\_hrisk*), (2e) types of the assets (a set of variables denoted as *asset\_pfixed* – Polish fixed income assets; *asset\_ffixed* – foreign fixed income assets; *asset\_pstock* – Polish stock; *asset\_fstock* – foreign stock; *asset\_estate* – real-estate assets), and (2f) geographical location of the firm (16 administrative regions).

As mentioned, we also employed the responses to the first and second questionnaire queries (Q1 and Q2) as additional explanatory variables. Q1 was formulated as follows: 'To what extent are your information needs satisfied by the sources you use in your job?' We used a Likert scale to collect the replies to the question (very high; high; moderate; low; very low). We were interested whether the extent to which the surveyed institutions are satisfied with the data and information sources they have at hand explains the differences in the belief that social media can be useful in chasing additional returns. In Q2 we asked the respondents to 'Indicate the statements they identify themselves with as to their job'. We designed the question as a vehicle allowing us to gain an additional insight into the forces behind the observed selection patterns. We expected that the responses 'We need different data and information from what we needed couple of years ago' (variable denoted as *info\_change*) and 'The advantage is hidden in the analyses of massive amounts of non-homogenous data and information' (variable denoted as *info\_large*) would be more frequently selected by those who believe that monitoring social media content can be rewarded with additional returns. Other suggested replies available for selection at this point were as follows: 'The magnitude of data and information is so big that it is hard to work the way through it' (variable denoted as *info\_much*), 'The visualization of data and information gains in the value' (variable denoted

as info\_visual), and ‘Despite progress, we lack an all-encompassing database for financial market professionals’ (variable denoted as info\_one).

In total, we applied four models (hereafter marked from 1 through 4), which were gradually (incrementally) supplemented with additional independent variables. Therefore, Model 4 was the most exhaustive. On the other hand, Model 1 was unique in the sense that it was the only model that included, except respondent-specific characteristics, asset value as the explanatory variable. The variable was excluded from other models to maintain comparability of results across the entire sample, since (as mentioned above) only about half of the respondents revealed the asset value in the survey. Finally, in all models the rationale behind the selection of benchmarks was the highest VIF value / p-value.

## 4 Results

Of special concern to us was the question through which we gathered opinions as to whether social media content can help in earning additional returns (Q6). 57% of the respondents stated that such content can be a lever of financial market returns, while about a quarter stated the

opposite (details are given in Table 1).

We were also interested in what type of social media content is valuable for the surveyed individuals. Following the existing literature, in the range of options for selection we suggested as follows: sentiment, emotions (assuming that both optimism and pessimism can be expressed with different strength or intensity driven by emotions), message volume, and polarization of opinions. We obtained extraordinarily even distribution of answers in which every suggested option was indicated by about 40-50% of the respondents.

The regression models, designed to examine the drivers behind the belief that monitoring social media can result in additional returns, brought some additional interesting outcomes. Firstly, the respondents’ experience variables (exp\_general and exp\_occup) turned out to be statistically significant. We discovered that more experienced financial market professionals were less likely to report that monitoring social media content can lead to additional returns. We also noticed some interesting phenomena as to the explanatory power of job position. What we found out suggests that the respondents whose duties are closely (i.e. more directly) associated with making investment decisions or recommendations are less likely to believe that social media content can yield additional returns

Table 1: Distribution of survey responses

\* The respondents were permitted to select any number of answers.

QUESTION	%	N
<b>Q6: Do you think that monitoring social media content can result in additional returns?</b>		
Yes	56.6	235
No	25.3	105
It's difficult to say	18.1	75
Total	100	415
<b>Q7: What would you like to extract from social media content for your job purposes?*</b>		
Sentiment	54.5	226
Emotions	42.4	176
Message volume	47.7	198
Polarization of opinions	48.9	203
Other (indicate)	21.4	89
<b>Q8: Would you like to have software allowing for real-time monitoring of internet media, including social media, and converting its content into numbers, such as a proxy of market sentiment?</b>		
Yes	25.3	105
No	47.5	197
It's difficult to say	27.2	113
Total	100	415

as compared to those who are loosely linked to making decisions of this kind. Strikingly, our study proved that the likelihood is the lowest among analysts (the only group for which the regression results were statistically significant) and the highest among ‘other’ employees of the surveyed financial institutions, such as spokesmen (with key decision makers – i.e. executives and owners – placed between these two groups holding opposite perspectives). However, the opinions of ‘other’ employees were characterized by a high standard error.

Looking at firm-specific characteristics, the relationship between firm type and the explained variable was statistically significant only for universal banks, insurance firms, and other financial institutions (these firms reported that monitoring social media content cannot lead to additional returns). However, neither asset type nor asset value exhibited statistical significance as explanatory variables. Also, there was no spatial pattern in the distribution of answers concerning the relevance of social media content for financial market returns.

The inclusion of the responses to the first and second questionnaire queries, as additional explanatory variables, in regression modelling (Model 4) shed additional light on the issue under investigation. Having imposed some zero restrictions on the parameters of the model that were close to zero, we obtained statistically significant results for some of the newly introduced variables. This pertains to how satisfaction with data and information sources that are used (variable coded as `info_satisfact`) is associated with the opinion regarding the benefits of social media monitoring in terms of additional returns (the more satisfied respondent, the greater likelihood to affirm the belief in such returns).

## 5 Discussion

Despite the differences in opinions regarding the usefulness of social media in earning additional returns, the respondents were confident when formulating their opinions: they had a clear and in most cases positive view of the issue (i.e. they believed that social media could support them in hunting investment opportunities). Only 18% replied that it was difficult to say whether social media can help in achieving additional returns. It is hard to assess the distribution of responses to the question, as – to the best of our knowledge – this is the first study examining the issue. Hence, there is no benchmark which would enable a comparative discussion. However, such results seem to be consistent with what is known from sentiment analysis literature. As mentioned above, empirical findings in this field did not bring unambiguous evidence that could encourage financial community to turn to social media in order to look for more opportunities to earn additional returns, or discourage them from this idea.

Not surprisingly, only sentiment was pointed by the

majority of respondents (almost 55%) as a variable they would like to extract from social media. This may stem from greater popularity of this variable in professional analyses compared to other variables which we suggested. As a result, the term ‘sentiment’ can be more widespread in the financial community. We also scrutinized the comments and remarks made when the option ‘Other’ was selected (which in fact was quite often, slightly over 21% of the sample). Most of them were focused on client data and information: customer experience, their preferences, the extent to which the firm’s offer is customized to their needs, opinions concerning the firm’s products, etc. Some comments revealed, however, a lack of understanding as to the essence of the issue under scrutiny. For example, some respondents stated that they consulted social media for stock quotations and investment returns data. Hence, the body of evidence we gathered can prove some shortcomings of surveyed individuals in their knowledge or understanding of some key concepts and terms that were examined (e.g. social media boundaries, the meaning of decisions prompted by emotions rather than reason and the way they can be anticipated by the signals extracted from social media content, such as the tone of the text or buzz around a security).

This is visible in contradictory answers that become apparent in the analyses confronting responses to at least two questions at the same time. In the light of the prevailing opinion that social media can convey signals relevant for investing in such assets as shares, it is striking that about half of the respondents stated that they would not be interested in software allowing them for real-time monitoring of Internet media, including social ones, and converting its content into numbers, such as a proxy of market sentiment. We expected that these two – the opinions concerning the relevance of social media in terms of its effect on financial market returns, and the need for a computer science-based infrastructure that facilitates unlocking the potential of such media – would go together. Certainly, what we found out was a puzzling result. We take two possible explanations into consideration. First, answering this question the surveyed individuals treated us as salesmen and informed us about their lack of interest to avoid insistence in the future. Second, the negation can mask real interest in such software and some efforts made to develop it within the institution, but kept secret from market competitors.

One of our key findings concerns the relationship between respondent-specific characteristics (experience and job position) and the likelihood of declaring that social media can be useful in looking for additional financial market returns. Assuming that ‘more experienced’ means also ‘older’, the skepticism of more experienced respondents detected in our study can result either from their reluctance to social media (as younger people are more enthusiastic about them), or from the fact that their rich experience



Table 2: Regression analysis results

Standard errors in parentheses, *p*-values in square brackets. \* means significant at 0.1, \*\* means significant at 0.05, \*\*\* means significant at 0.01. Constants were included in the models, but omitted in the table. In the case of each variable *VIF* < 3.

Variable	Model 1		Model 2		Model 3		Model 4	
exp_occup	−0.215	(0.126)*	−0.289	(0.101)***	−0.312	(0.106)***	−0.236	(0.099)**
exp_general	−0.142	(0.099)	−0.189	(0.084)**	−0.181	(0.088)**	−0.137	(0.087)
asset_value	0.099	(0.123)						
asset_number	−0.029	(0.182)						
firm_fund			−1.000	(0.708)	−0.971	(0.756)	−0.662	(0.627)
firm_house			−0.569	(0.696)	−0.755	(0.725)		
firm_insurer			−1.075	(0.581)*	−1.005	(0.605)*	−0.786	(0.443)*
firm_advisory			0.020	(0.622)	−0.025	(0.630)		
firm_otherfin			−1.555	(0.747)**	−1.695	(0.773)**	−1.294	(0.651)**
firm_ubank			−1.025	(0.510)**	−0.907	(0.520)*	−0.813	(0.386)**
firm_broker			−0.634	(0.601)	−0.623	(0.627)	−0.349	(0.496)
firm_other			−0.409	(0.622)	−0.362	(0.646)	−0.205	(0.498)
occup_analyst			−1.310	(0.682)*	−1.251	(0.712)*	−1.220	(0.676)*
occup_executive			0.339	(0.450)	0.423	(0.472)	0.387	(0.456)
occup_specialist			0.034	(0.604)	0.062	(0.623)	0.094	(0.591)
occup_broker			−0.277	(0.412)	−0.010	(0.449)	−0.191	(0.412)
occup_findir			−0.660	(0.638)	−0.661	(0.657)	−0.267	(0.664)
occup_owner			0.139	(0.405)	0.249	(0.423)	0.251	(0.412)
occup_other			1.438	(1.199)	1.587	(1.209)	1.233	(1.203)
asset_pfixed			0.483	(0.425)	0.416	(0.444)	0.352	(0.438)
asset_ffixed			0.602	(0.674)	0.562	(0.695)	0.619	(0.690)
asset_pstock			0.210	(0.388)	0.212	(0.399)	0.133	(0.397)
asset_fstock			−0.802	(0.502)	−0.839	(0.525)	−0.650	(0.520)
asset_estate			0.446	(0.441)	0.534	(0.458)	0.286	(0.445)
asset_hrisk			0.498	(0.374)	0.557	(0.387)	0.501	(0.387)
doln					−0.715	(0.609)		
kuja					−0.379	(0.527)		
lube					0.018	(0.593)		
lubu					0.731	(1.165)		
lodz					0.147	(0.770)		
malo					−0.509	(0.527)		
opol					−1.836	(1.341)		
podk					−0.258	(0.595)		

Table 2: Regression analysis results (continued)

podl					−0.463	(0.707)		
pomo					−0.647	(0.555)		
slask					−1.008	(0.547)*		
warm					−0.804	(0.806)		
wiel					−0.280	(0.572)		
zach					−0.699	(0.775)		
info_satisfact							0.270	(0.099)***
info_change							0.313	(0.416)
info_much							0.139	(0.273)
info_large							0.491	(0.279)*
info_visual							0.430	(0.300)
info_one							0.313	(0.270)
N	171		335		335		327	
Log-likelihood	−103.0		−189.5		−185.2		−182.7	
AIC	215.9		427.0		446.5		419.4	
BIC	231.6		518.5		591.4		521.8	
HQ	222.3		463.5		504.3		460.3	
% predicted	69.6		73.4		71.6		74.3	
LR	7.4	[0.11]	39.2	[0.02]**	47.7	[0.11]	42.0	[0.03]**

enabled them to more accurately diagnose social media content potential. We believe that the observed patterns can be at least partly explained by a psychological effect according to which more experience leads to the attitude of shedding illusions and, as a result, to less optimism. More experienced people are more cautious and reserved. Considering that not only more experienced respondents, but also those who were more directly involved in making investment decisions or recommendations, displayed a higher likelihood of skepticism about social media potential for earning additional returns, the latter explanation seems to be more plausible. Alternatively, the observed relationships can be attributed to a higher expertise of more experienced respondents.

Also, the importance of previous experience for the perception of social media informative potential can be confirmed by positive relationship between *info\_satisfact* variable and dependent variable. What we established indicates that the respondents who were more satisfied with the information sources they used were more likely to recognize the potential of social media for their work purposes. Moreover, the probability was also higher among those respondents who shared the opinion that analyzing

large sets of diversified data and information can guarantee outstanding performance in the market (*info\_large*). This is reasonable as the recognition of social media potential for the opportunity of achieving additional returns must be preceded by deep understanding of big data prospects and a belief that they are realizable. Although statistically insignificant, a visible and positive correlation occurred also between the dependent variable and variables representing the changing demand for data and information in recent years (*info\_change*), as well as the lack of one complete and comprehensive source of data and information (*info\_one*).

## 6 Conclusions

We found out that the majority of surveyed finance professionals believed that social media content could be useful in pursuing additional financial market returns. Interestingly, more experienced financial market professionals, especially analysts, were more inclined to neglect the potential of social media content in this respect. Moreover, we established that those who were more satisfied with

the sources of information on which they had relied so far were also more inclined to affirm that the use of social media can increase market returns. Overall, these findings point out a particular role of former experience for the attitudes towards the opportunities created by social media for financial market participants, a phenomenon known from other fields. Undoubtedly, social media as an information source for financial community is still a novelty. Hence, the perception of its prospects is subject to the same factors as the perception of other innovations, and previous experience is certainly one of them. What we observe today can be considered a natural wariness typical for the early stages of innovation developments. This wariness is further enhanced by ambiguous results of sentiment-based empirical research. The insignificance of almost all firm-specific variables in the models which we applied in our study is understandable and can be justified by the specificity of the dependent variable, i.e. financial professionals' perception of social media potential for achieving additional returns. Such variables as views, opinions or perceptions are better explained by personal respondent-specific characteristics.

Although the majority of respondents recognized the potential of social media, only one out of four expressed an interest in professional software allowing for real-time social media monitoring and converting its content into useful decisional signals. This finding is intriguing as it is contrary to considerable interest in social media as an informational source in and of itself. Certainly, the reasons behind this mismatch seem to be one of the most interesting avenues for further research. At the same time, the observed mismatch can suggest that the prospects for business intelligence firms developing professional software solutions for finance industry interested in making use of social media content can be questionable.

Our study is limited in some respects and these limitations create opportunities for future research. Firstly, since the existing literature on the use of social media by finance professionals is still scarce, we tested as independent variables only the parameters suggested by the literature and intuitively relevant for the issue under consideration. Presumably, some other variables exist that can be potentially significant for a better understanding of finance professionals' attitudes towards social media potential. Secondly, perhaps the application of an alternative research model would reveal some other important patterns. We applied logit models which are typically used to analyse factors that influence the probability of a certain occurrence, or when a phenomenon can be described by a binary variable. Thirdly, we cannot exclude the possibility that our results are country-specific, which opens an avenue for more extensive international comparative studies.

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### **Ali lahko družbena omrežja vplivajo na povečanje donosov na finančnih trgih? ugotovitve s Poljske**

**Ozadje in namen:** V zadnjih letih se je pokazalo vse več dvomov v ustreznost klasične teorije finančnih trgov, ki temelji na racionalnosti odločevalcev. Ponavljajo se anomalije in odstopanja od te teorije, ki postajajo »nova normalnost«. Zato strokovnjaki posvečajo vse več pozornosti vedenjskim konceptom, ki se lahko z drugega vidika osvetlijo odločitve udeležencev na finančnem trgu. Hitri razvoj družbenih medijev je spodbudil raziskave, ki bi proučevale takšne koncepte, saj so mediji odprli nov "laboratorijski prostor" za preverjanje vedenjskih hipotez. Glavni namen članka je preučiti, ali strokovnjaki na finančnem trgu verjamejo, da je mogoče vsebine družbenih medijev uporabiti za doseganje dodatnih donosov na finančnih trgih, in identificirati dejavnike, ki vplivajo na te donose.

**Zasnova / metodologija / pristop:** V raziskavi smo zajeli vzorec več kot 400 strokovnjakov na finančnih trgih v institucijah, ki delujejo na Poljskem, in analizirali rezultate z uporabo logit regresijskih modelov.

**Rezultati:** Skoraj 60% anketiranih finančnih strokovnjakov prepoznava potencial družbenih medijev za doseganje dodatnih donosov. Ugotovili smo tudi, da bi lahko razlike v zaznavanju tega potenciala pojasnila predvsem heterogenost njihovih delovnih izkušenj in, v manjši meri, njihovo delovno mesto. Pokazalo se je, da izkušeni strokovnjaki manj verjetno prepoznajo te možnosti manj izkušeni posamezniki. Za posamezna podjetja specifični dejavniki po naših ugotovitvah nimajo pomembnega vpliva na dodatne donose.

**Zaključek:** Mnenja strokovnjakov na finančnih trgih glede povezave med družbenimi mediji in dodatnimi donosi, so mešano. To se sklada z ugotovitvami, ki jih so jih prinesle študije, ki temeljijo na raziskovanju občutkov.. Naše ugotovitve potrjujejo ključno vlogo predhodnih izkušenj pri pojasnjevanju odnosa do novosti in inovacij (kot so družbeni mediji), pojav, znan iz drugih področij in iz vsakdanjih izkušenj.

**Ključne besede:** družbeni mediji; sentiment; vedenjske finance; finančni trg; donosi na finančnih trgih

## Appendix

Listed below are only the questions relevant to theme of the article (as mentioned in the article, our aim was to achieve a number of research objectives in one survey).

Q1: To what extent your information needs are satisfied by the sources used by you in the job?

- Very high
- High
- Moderate
- Low
- Very low
- Difficult to say

Q2: Indicate the statements you identify yourself with as to your job.

- We need different data and information from what we needed couple of years ago
- The magnitude of data and information is so big that it is hard to work the way through it
- The advantage is hidden in the analyses of massive amounts of non-homogenous data and information
- Visualization of data and information gains in the value
- Despite progress, we lack all-encompassing database for financial market professionals
- The information needs are sufficiently well-feed, hence there is no necessity for a change in this field

Q6: Do you think that monitoring of social media content can result in abnormal returns?

- Yes
- No
- Difficult to say

Q7: What would you like to extract from social media content for your job purposes?

- Sentiment
- Emotions
- Message volume
- Polarization of opinions
- Other (which?)

• Q8: Would you like to have software allowing for real-time monitoring of internet media, including social media, and converting its content into numbers, such as proxy of market sentiment?

- Yes
- No
- Don't know – I would have to learn more about that

Respondents' particulars:

Q12: What is the institution you work in?

- Universal bank
- Investment bank
- Brokerage house
- Other brokerage activity
- Investment funds / Asset management / Private equity / Venture capital
- Insurance company
- Finance advisory company
- Other financial institutions
- Other

Q13: What is your job position in the institution? (Open question)

Q14: Since when you are on the position (in completed years)?

- 1 or less
- 2-4
- 5-7
- 8-10
- More than 10
- No answer

Q15: How long have you been working with listed companies analytics or / and asset management (in completed years)?

- 1 or less
- 2-4
- 5-7
- 8-10
- More than 10
- No answer

Q16: Indicate the value of assets under management of the institution you work in (in PLN million).

- (0; 100]
- (100; 1,000]
- (1,000; 10,000]
- (10,000;  $+\infty$ )
- No answer

Q17: Indicate approximated percentage share of the following assets in the institution you work in.

- Cash & equivalents
- Polish fixed-income assets
- Foreign fixed-income assets
- Polish shares
- Foreign shares
- Real-estate assets
- Other
- No asset management

Q18: Indicate voivodeship the institution you work in is located.

(List of 16 voivodeships in Poland)