How Social Media Can Be Used to Predict the Stock Market Development

Various studies in finance and psychology have shown that the stock market can be driven by mood states of market participants. For instance, sleeping habits (Kamstra et al., 2000) determine the people's feelings and investment behavior. Hishleifer and Shumway (2003) found a positive relationship between sunshine and stock returns. Other authors refer to depressions (Kamstra et al., 2003) or the outcome of soccer games (Edmans et al., 2007) which both affects the investors' sentiment and in turn investment decisions.

The influence of sentiment on the stock market development can be explained by considering the investor's risk assessment. The link between mood levels and risk behavior is well established in the literature. For instance, several authors provide evidence that high sensation seekers are more likely to take economic and financial risk, while low sensation seekers show lower risk-taking tendencies (Harlow and Brown, 1990; Horvath and Zuckerman, 1993; Wong and Carducci, 1991). People with lower risk appetite prefer riskless assets over risky assets (Bierwag and Grove, 1965; Hicks, 1963). Thus, stock returns should increase (decrease) if investors are in good (bad) mood (Figure 1).

With the rise of the Internet and Social Media applications in particular, researchers have now the opportunity to extract emotions from user-generated content and to precisely estimate mood levels. The social mood (Nofsinger, 2003) can be used as a proxy for the investor sentiment. First studies in this research area deliver promising results. Bollen et al. (2010) have shown that mood levels extracted from public tweets have predictive value to the Dow Jones Industrial Average. In a recent study, Karabulut (2012) also found that Facebook's Gross National Happiness can predict returns in the US stock market.

Our research builds on these previous results and aims to further improve the forecast accuracy of user-generated content by taking into account the network structure of the Social Web. Among others, geographic data about a person's location and the number of followers are part of our dataset. The question seems to be no longer *if* Social Media can be used to predict stock returns but rather *how* market participants can achieve superior returns. Since the beginning of 2011, our computer systems continuously collect posts from Social Media sources (e.g. Twitter, Facebook). By analyzing more than four million tweets per day we created an algorithm that computes a collective mood state indicator that we translate into real-time trading recommendations for a number of different stock markets in the world (e.g. Germany, UK, US).

Figure 1: Relationship between Investor Sentiment and Stock Returns

Besides assessing mood levels of investors, we also aim to use Social Media for measuring the company sentiment. User-generated content which represents consumers' direct feedback on products has become increasingly important for investors. Various studies provide evidence that online expressions of interest can be used to predict future sales or stock returns. Company sentiment was measured with the help of consumer reviews (Tirunillai and Tellis, 2012), expert reviews (Tellis and Johnson, 2007), Internet message boards (Das and Chen, 2007) and Google search trends (Choi and Varian, 2009).

Our portfolio consists of several blue chip companies which are major subjects in discussions of the Internet community. Based on the current sentiment our algorithm creates buy or sell recommendations for each particular stock. During our track record of virtually two years (01/2011 – 11/2012) our portfolio achieved a return of 34.86%. We are thus able to clearly outperform major stock indices such as DAX and S&P 500 which only gained one-digit or small two-digit percentage gains within this time period.

This research is a joint project with Dipl.-Kfm. Michael Nofer.

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Prof. Dr. Oliver Hinz holds the Chair of Electronic Markets at the TU Darmstadt since April 2011. His academic work focuses on problems at the intersection of markets and technology. He graduated in Business Administration and Information Systems at the TU Darmstadt and worked as consultant in the financial service industry for several years. He then acquired his PhD at the Goethe University and was part of the E-Finance Lab as Junior Professor (2009-2011).

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