Does Twitter mood impact stock market indexes?

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Introduction

In contrast to the evident fact that changes in the economy could determine the public mood, the influence of social mood on the economy is less obvious. The appearance of the Tweeter which allows people to express their emotions and moods with combination of econometrics leads to a possibility to analyze the impact of social mood on the stock market. In our study, we examine the frequency of use of the sentiment words and their impact on the volatility of DJIA and S&P stock market indexes.

Methodology

- More than 700 million of tweets for the period from 14.02.2013 to 19.05.2014 are collected via Twitter API
- For each day the number of posts, containing the words from an original sentiment vocabulary, is counted; normalized counts are used as regressors
- 256 ARMA-GARCH models are estimated on two thirds of the sample
- The best specification of ARMA-GARCH model is obtained after the outof-sample comparison according to Mean Squared Error (MSE) criteria

Results

We formed a vocabulary of 172 sentiment words, including smiles and Twitter acronyms (e. g. `lol`, `wth`). Fig. 1 illustrates the frequency of appearance of different words in the collected corpus.

To estimate the influence of different sentiments on indexes' volatility we evaluate ARMA(p,q)-GARCH(k,m) with p, q, k and m ranges from 0 to 3. The significant on 5% level sentiment words are presented in Fig. 2, where the dots show point estimates of the coefficients before sentiments words on x-axis and red lines depict 95% confidence bounds.

Our main result is that in most cases the negative sentiment words demonstrate significant (and positive) influence on the volatility of indices. There are 3 exceptions to this rule: 'superb', 'luck' and 'bright'. We think it might be caused by the drawback of corpus processing algorithm, which does not take into account sarcasm or ambiguity in tweets.

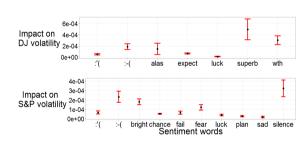


Fig. 2 The influence of sentiment words (x-axis) with 95% confidence intervals



Fig. 1 Wordcloud showing the frequencies of vocabulary words in analyzed tweets

We also measure GARCH out-ofsample performance without sentiment words in volatility equation and find out that MSE is greater when sentiment words are not presented.

Fig. 3 demonstrates the mean squared error of volatility forecasts, centered relative to the minimum. The best MSE forecasts provide 'sad smile' in the case of DJ index and 'bright' in the case of S&P. Deep blue bars refer to the case when no sentiment word is included in volatility equation.

Conclusions

This study provided some evidence that basic emotions is an important driver of stock market volatility. We found that occurrence of words with negative connotation, such as `:-(` or `wth`, could predict increasing of volatility and improves the forecast accuracy of ARMA-GARCH model (Fig. 3).

Evidently, the analysis of Twitter moods is worth further investigation in the context of financial time series modelling.

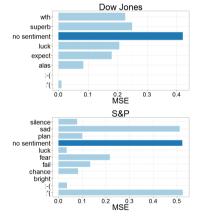


Fig. 3 Forecast mean squared error

Literature cited

Kalampokis, E., Tambouris, E., & Tarabanis, K. (2013). Understanding the predictive power of social media. Internet Research, 23(5), 544-559.

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Research perspectives

Our work will be continued in the direction of enhancing the methodology of processing the Twitter data and studying the predictive power of Twitter moods. More precisely, we plan

- · apply Support Vector Machine regression to classify trading days by the people's mood
- compare the influence of emotions and such factors as stock market regulation, insider information
- try to build a trading strategy based on sentiment analysis

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