Correlation between Fundamental Analysis and Price

Executive Summary

In this paper, we attempt to analyse the relationship between e-commerce platform performance indicators and Fundamental Analysis, against its stock price. Some e-commerce platform performance indicators we investigated include sales volume, review volume as well as click volume. Regarding Fundamental Indicators, we used a mixture of both liquidity ratios and profitability ratios.

Introduction

Fundamental analysis is a strategy for assessing a security while trying to assess its intrinsic value, by looking at related economic, financial, and other qualitative and quantitative elements. Fundamental analysts examine whatever can influence the security's value, including macroeconomic factors (e.g. economy and industry conditions) and microeconomic elements (e.g. financial conditions and company management). The ultimate aim of fundamental analysis is to deliver a quantitative value that an investor can contrast with a security's present value, in this way showing whether the security is undervalued or overvalued.

Liquidity ratios are a type of financial measurements used to find out the ability of a debtor to repay current debt obligations without increasing external capital. Liquidity ratios measure the capability of a company to pay debt obligations and their margin of safety by finding metrics such as the Working Capital, Current Ratio, and Quick Ratio.

In this paper, we have decided to choose Current Ratio as a measure of liquidity. The Current Ratio measures a company's potential to pay interim and long-term obligations.

Current Ratio = Current Assets / Current Liabilities

Profitability ratios are a kind of financial indicators used to measure the ability of a company to generate profits in relation to its related expenses. For majority of the indicators, having a higher value compared to the ratio of a competitor or the same ratio compared to the previous period indicates that the company does well.

In this paper, we have chosen Profit Margin as a measure of profitability. Profit Margin shows the ratio of sales that has transformed into profits.

Profit Margin = Net Profits (or Income) / Net Sales (or Revenue)

Methodology

We have decided to focus on Shopee as the E-commerce platform to analyse.
Some of the data that we have access to is aggregate (Click Volume), others are categorical (Review Volume and Sales Volume). Since representative categories change over time, using aggregated data would help achieve a more accurate result.

Click Volume

We could

1) Scrape the exact click volume by collaborating with Shopee. However, this may not be feasible because the company normally does not reveal the click volume to the public.

2) Use third party website to get the estimated aggregated click volume (e.g. https://www.alexa.com/siteinfo/shopee.sg) . We could get historical click volume estimation via this method, hence back testing is achievable. However, the estimated click volume may not be accurate.

Review Volume

Since review volume is usually shown per item and aggregated review volume is not available, we intend to approximate the total amount using random sampling. Meanwhile, we would try to source for data using web scraping.

Sales Volume

This can be done in a similar fashion compared to review volume.

Data Analysis

Equal weights will be assigned to the two financial ratios, click volume, review volume and sales volume to determine a score. Correlation between change in price per unit time (DP) and change in score per unit time (DS) will be calculated. We will manually vary weights to recalculate DS. Our aim is to identify the best weights that maximize the absolute correlation between DP and DS.

Multivariate ARIMA will be used to predict future explanatory variables (two financial ratios, click volume, review volume and sales volume). Regression with ARIMA errors will be used to predict price with explanatory variables. We will manually vary the hyperparameters for regression, to minimize root mean square error (RMSE). To minimize overfitting, stepwise regression and hypothesis tests will be carried out to see whether all explanatory variables are significant.

Problems to tackle

Problems include trying to find sources that provide regular updates of Fundamental Indicators. We have found Nasdaq and Marketwatch as potential sources; however, the data is provided yearly, which would be difficult to use to generate signals.

In addition, finding Review Volume and Sales Volume via web scraping is not feasible for back-testing; scraped data can only show present volumes. As for Click Volume, the current method does allow for back-testing, but the data might be approximated.

For data analysis, the method used to calculate correlation removes the concept of time; this may not be favourable as time series data tend to have seasonal relationships. As for the method used to predict future prices, ARIMA has to be used twice; this may lead to compounded errors and we would need to investigate if there is a method that can predict future prices without first predicting the explanatory variables.

Potential improvements in data analysis include using Grid Search Cross-Validation or Random Search Cross-Validation to optimise hyperparameters, instead of finding them manually.

Areas to explore further

1) **Problem:**
   We have only found annual update of Fundamental Indicators, thus decreasing the feasibility of developing models and back-testing in the future;
   Action:
   Continue to source for quarterly updated data. (eg. via Bloomberg)

2) **Problem:**
   Data analysis using time series analysis needs prediction first on explanatory variables, then on future stock prices, thus decreasing the accuracy of our possible results;
   Action:
   Explore other possible models. Refer to research papers that look into similar topics.

3) **Problem:**
   Historical aggregated Review Volume and Sales Volume are not available.
   Action:
   Explore possible websites to look for aggregated Review Volume and Sales Volume; scrape Review Volume and Sales Volume by collaborating with Shopee.

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Annex

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