

Social Media Popularity and Financial Performance in Ecuadorian Market

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RESUMEN

Descubrir las tendencias que relacionan las redes sociales y los indicadores financieros puede ayudar a las empresas a rastrear la percepción del cliente a lo largo del tiempo y comprender mejor el impacto de los diferentes eventos en la rentabilidad de las empresas. Se ha recopilado datos de Facebook y Twitter de 32 empresas ecuatorianas categorizadas en 9 industrias para conocer las relaciones entre el rendimiento financiero de una empresa y las métricas de atención en línea. El objetivo es diseñar métricas cuantitativas para que las industrias midan la actividad y la atención que atraen en las redes sociales, visualicen las correlaciones existentes entre la atención social y el desempeño financiero, y pronostiquen los ingresos de una empresa en función de la atención normalizada que recibe en Facebook. Se ha confirmado que, en Ecuador, el público participa a través de Facebook. Por lo tanto, las métricas basadas en Facebook muestran una alta correlación con los indicadores financieros, especialmente los ingresos y los gastos de publicidad, pero no encontramos una correlación significativa entre las métricas de Twitter y los indicadores financieros. Finalmente, se emplearon tales métricas para predecir el desempeño financiero de una empresa en Ecuador.

Palabras claves: Atención en línea, actividad en línea, atención normalizada, indicadores financieros, desempeño financiero

ABSTRACT

Uncovering trends that relates social media and financial indicators can help firms to track the customer perception across time and understand better the impact of different events on enterprises' profitability. We have collected Facebook and Twitter data from 32 Ecuadorian companies categorized in 9 industries to find out relationships between financial performance of a firm and online attention metrics. We aim to design quantitative metrics for industries to measure the activity and attention they attract in social networks, visualize the existing correlations between social attention and financial performance, and predict the revenue of a firm based on the normalized attention it receives on Facebook. We have confirmed that, in Ecuador, the audience engage through Facebook. Thus, Facebook based metrics exhibit a high correlation with financial indicators, specially revenue and advertising expenditure, but we did not find a significant correlation between Twitter metrics and financial indicators. Finally, we employ such metrics to predict the financial performance of a company in Ecuador.

Key words: Online attention, Online activity, Normalized attention, Financial indicators, Financial performance

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I. INTRODUCTION

Social network sites, known as SNS, are a powerful tool for reaching customers and building a strong brand digital presence. Social media have modified the way companies promote their products. Posts advertising new features or sales periods appear in, most of the time, potential customers' news feeds. Company news and promotions published through different social channels are generating growing amounts of data. Business analysts search for valuable signals drawn from such data (Bello-Orgaz, Jung, & Camacho, 2016).

Platforms such as Twitter and Facebook have gained considerable popularity among consumers, and corporations managers are realizing the huge potential that social media has to engage with customers and reach new audiences (Gallaughner & Ransbotham, 2010).

Managers have been focused on the central question whether their firm's presence in social media add value to the firms bottom line (Kaske et al., 2012), or it is just the new buzzword. Since strategic decisions in a firm are mainly based on profit maximization, managers need to verify whether social medias long-term benefits outweigh the costs of the investment (Lenskold, 2003).

Quantifying the online attention received by companies and their correlations with financial indicators across time might help to understand better the impact that interactions in these new channels have on enterprises' profitability (Vaca Ruiz et al., 2014). It is needed to design strong signals to approximate real companies' performance from existing data.

In this study, we aim to find out relationships between financial performance of a firm and online attention metrics measured with Facebook and Twitter interactions. Finding a pattern that relates social media activity with financial indicators can help firms to track the customer perception across time with a low-cost approach. We have collected Facebook and Twitter data because those platforms are the most influential SNS in Ecuador. However, the metrics proposed can be calculated on datasets collected from any other platform such as Instagram or LinkedIn. Correlating online signals with offline performance we make three main contributions:

- Design quantitative metrics for industries to measure the activity and attention they attract in SNS.
- Visualize the existing correlations between social attention and financial performance reached by companies in different industries in Ecuador.
- Propose a model to predict the revenue of a firm based on the normalized attention it receives of Facebook.

The paper proceeds as follows. Section II gives a brief overview of previous researches and related work. Section III describes the data, the time and its features. The theory and the statistical methods are described in Section IV. Section V and VI provide the results and the details of our findings. Finally, in Section VII we make some conclusions and suggest future research directions.

II. RELATED WORK

There is a considerable amount of literature on sentiment analysis and its relationship with the financial performance of a firm like stock returns. Sentiment analysis is the computational study of opinions, feelings and emotions expressed in text. The use of data mining techniques to predict the financial markets has been extensively studied in numerous publications (Schumaker & Chen, 2009). The effect of social media and conventional media, their relative importance, and their interrelatedness have been studied on short term firm stock market performances (Yu et al., 2013). The relationship between social

media-based brand engagement and purchase intention has been found to be associated with a potential return on investment (Coursaris et al., 2016).

A framework specifically can foster the understanding of customer centered social media and provides executives with a tool to decide on whether to implement social media or not. Selected empirical examples illustrate that social media lead to positive ROI across the analyzed social media platforms (Kaske et al., 2012). Web visibility was found as a significant determinant of firm web traffic, and it improves both firm short- and long-term performances. It has also revealed that web visibility creates higher values for business-to-consumer (B2C) than business-to-business (B2B) firms, for firms with a value appropriation focus than those with a value creation focus, and for firms of search goods than those of experience goods (Wang & Xu, 2017).

A recent review of the literature on this topic found that a learn model is able to predict the social network sentiment and the stock performance; and its recent news and social data are also closely correlated (Attigeri et al., 2015). In statistical tests, the correlation of Facebook brand page fan counts and their respective brand company stock prices were found to be statistically significant (O'Connor, 2013). And the accuracy of DJIA (Dow Jones Industrial Average) predictions can be significantly improved by the inclusion of specific public mood dimensions, like Twitter public sentiment, but not others (Bollen et al., 2010).

A key problem with much of the literature is that the research has been limited to the stock market but developing countries do not have a sufficient amount of stock market data to replicate the same analysis. As an alternative, we use the main metrics of a firm's value: assets, equity, cash, revenue and profit. We also add the advertising expenditure to the set of financial metrics because of its importance in this research. The details of the dataset and its features are explained in Section III.

III. DATASET

Using Facebook and Twitter APIs, we collect social media data for 32 Ecuadorian firms. Such firms were selected based on the ranking built by Llorente & Cuenca in 2015 (Rivas & Llanos, 2016). In such ranking, socially engaged companies are ordered according to an influence measure proposed by Llorente & Cuenca. We started searching information for the top 50 companies in the ranking. However, we realized that just 32 companies in that list could be analyzed since the others were brands of bigger enterprises and the financial statements were not disaggregated.

For the financial indicators dataset, we collected the public data available at "Superintencia de Compañías del Ecuador" website. There were three companies with more than one brand, and instead of using their official social media accounts, we chose to use their most popular brands accounts. For instance, in the case of Cervecería Nacional we selected the social media accounts of 'Pilsener' and 'Club Premium'. For Nestle we used 'Galletas Amor' and 'Nescafe'. Finally, for DK Management we used 'Quicentro Shopping' and 'San Marino Shopping'. We took such decisions since we can assume that the social media activity of these companies is well represented by their most popular brands. In Figure 1 we show the process to get the results of each model used in this research.

The Facebook dataset was collected using the Graph API that let us to obtain posts, likes, shares and their corresponding meta data for the 32 firms since they maintain public accounts. For the Facebook platform, we obtained the total number of likes, posts and shares by each of the 32 firms. The resulting dataset contains 94,542 posts with a total of 1,829,080 likes and 158,276 shares received across time.

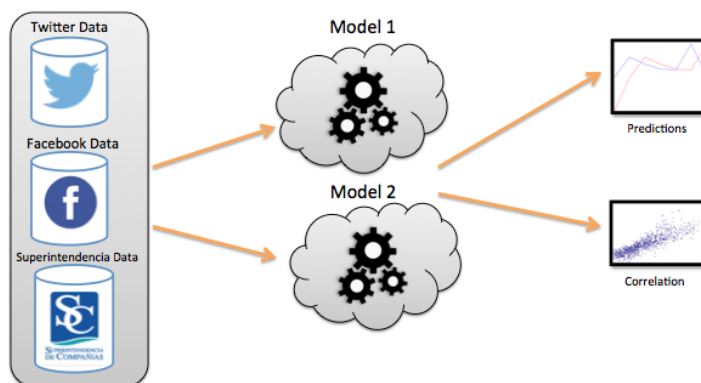


Figure 1. Architecture used.

Datasets extracted from Social Media and financial statements are fed to the model to predict financial performance of a company.

The Twitter dataset was obtained using the Twitter REST API to collect, for each of the firms in the study, tweets, retweets, favorites and the corresponding dates. The total number of tweets collected were 111,473 with a total of 47,378 favorites and 20,828 retweets. Due to the Twitter API rate limits and the different level of activity, for some firms we collected data starting two or three years ago, and for some firms, data corresponding only to this year. Figure 2 shows the number of posts and tweets published for each firm using their national accounts in 2017, since January to July. The 32 firms were categorized in 9 industries as shown on Table 2, in which we provide the companies that belong to each industry.

To summarize we collected six social media metrics from Facebook and Twitter that are the average likes, average shares, average retweets, average favorites and the total number of followers in each SNS. And we collected six financial indicators that are the total amount of assets, equity, cash, revenue, profit and advertising expenditure. Table 1 provides the principal variables and its description. In Section 5 we discuss and analyze the online activity and attention using social media metrics of Twitter and Facebook in each industry.

<i>Variable</i>	<i>Description</i>
Av_likes	Average of likes per post of a firm
Av_shares	Average of shares per post of a firm
Av_retweets	Average of retweets per tweet of a firm
Av_favs	Average of favorites per tweet of a firm
Follow_fb	Total followers on Facebook
Follow_tw	Total followers on Twitter
Assets	Natural logarithm of Assets
Equity	Natural logarithm of Equity
Cash	Natural logarithm of Cash
Revenue	Natural logarithm of Revenue
Profit	Natural logarithm of Operating Profit
Ads	Natural logarithm of Advertising Expenditure

Table 1: Variable Description.

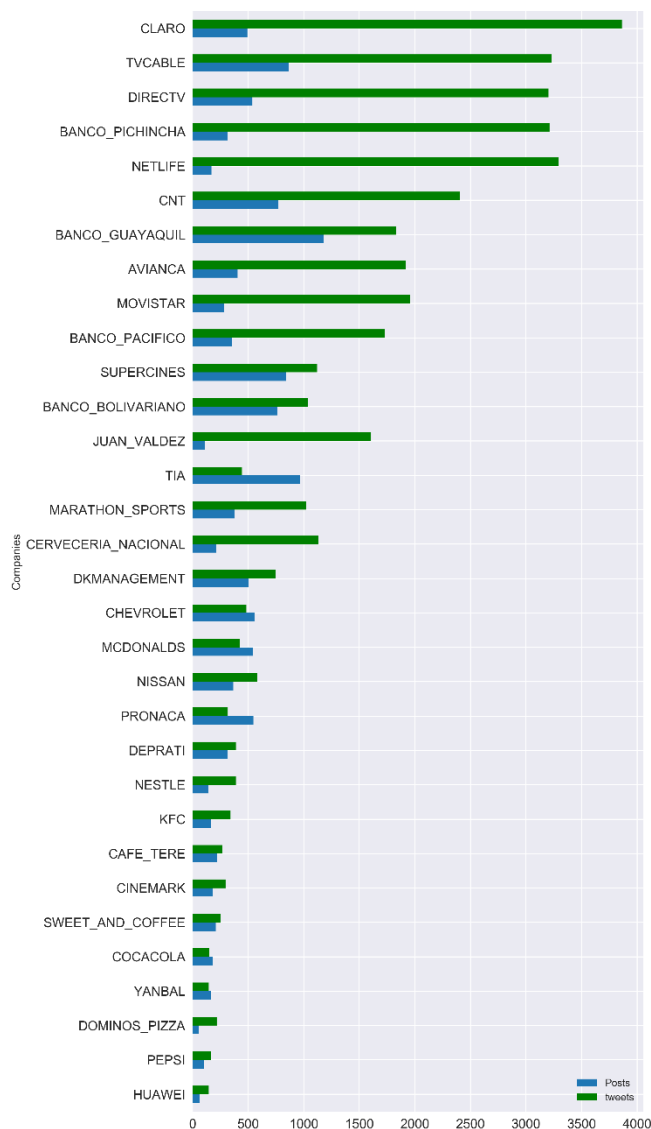


Figure 2. Posts and Tweets per firms of 2017.

Number of posts (Facebook) and tweets published from January to July 2017 in the local company social media account.

Industry	Companies
Bank	Pichincha, Pacifico, Bolivariano, Guayaquil
Automobile	Nissan, Chevrolet
Restaurants	Café de Tere, Juan Valdez, Sweet & Coffee, Domino's Pizza, McDonald's, KFC
Beverage & Food	Coca-Cola, Pepsi, Cervecería Nacional, Nestle, Pronaca
Clothing	De Prati, Marathon Sports, Yanbal
Retail	Tia
Telecommunications	CNT, Claro, Movistar, DirecTV, Tv-cable, Netlife, Huawei
Airlines	Avianca
Entertainment	DK Management, Cinemark, Supercines

Table 2: Industry Description.

IV. METHODOLOGY

We quantify social media engagement of a company using activity and attention indicators. Activity indicators correspond to the number of posts, reposts, and comments done, while attention is determined by the number of reposts or comments received from others (Vaca Ruiz et al., 2014). To measure activity, we consider the number of posts and tweets published by the company on Facebook and Twitter respectively. On the other hand, to measure attention we count the number of likes and retweets that the company received.

In order to describe and find which industries generate and attract more activity and attention in Twitter and Facebook we use the tweets and posts of the first seven months of 2017. To analyze the activity, we sum the posts and tweets in each month of every company, and then joining that by industry. In order to analyze the online attention, we defined the term: “normalized attention” in Equation 1.

$$normalized_attention_i = \frac{\sum_{t=1}^n metric_t}{posts} \quad (1)$$

Where:

- $metric_t$: Total of a determined social media metric in the post “ t ”.
- $posts$: Total posts of the industry in a month.
- $normalized_attention_i$: Normalized attention of the industry “ i ” in a month.

To find a relationship between normalized metrics and financial indicators we use the Spearman’s rank correlation (Spearman, 1904) that is a nonparametric method for the Pearson product-moment correlation. This method was chosen because it is one of the most practical ways to find a relationship in small samples, also it is not necessary to assume that we have normal data. For Spearman’s correlation we have the following formula:

$$\rho = 1 - \frac{6 \sum_{i=1}^n d_i^2}{n(n^2-1)} \quad (2)$$

We can test if the correlation is significant with 95% of confidence. Using correlations as a first step, we propose next a linear regression model to predict financial performance from normalized attention.

We chose the average likes of a firm’s Facebook, to predict the annual revenue of a company. In Figure VII Advertising Expenditure and Revenue have the highest correlation with the average likes of a post in Facebook. Given the inherent power of popularity to foster social conformity, enhanced by the opinion-influencing capacity of social media (O’Connor, 2013), average likes per post of the most popular firms are associated with the Revenue of the consumer brand companies that own these brands. This relationship is represented by the following formula:

$$Revenue_i = \alpha + \beta metric_i + \epsilon_i \quad (3)$$

Where:

- $metric_i$: normalized attention metric in a firm
- $Revenue_i$: Revenue of a company
- ϵ_i : Error term
- β : Return of an additional like you receive in a post
- α : Normalized attention of the industry “ i ” in a month

The results of the regression analysis and correlation analysis are specified in Section VI.

V. ACTIVITY AND ATTENTION

The online activity of a firm can be measured by the total of posts and tweets published in a given period of time. The online attention can be measured by the total of shares and likes in Facebook, and the total of retweets and favorites in Twitter. An additional metric to quantify online attention is the total of followers in the respective SNS. We aim to analyze temporarily the social activity and attention of the industries, using posts and tweets for activity, and likes and retweets for the normalized attention defined in Equation 1.

Twitter

To analyze the behavior of each industry in Twitter, we use the tweets of the 32 firms in 2017. Figure 3 shows the activity on Twitter of each industry. Telecommunication's industry is the most active on Twitter, with two peaks in February and June. In contrast, the Clothing industry is the least active in this platform. Interestingly, the first months of the year are the most active in most of the industries. To know the effectiveness of each tweet in the audience of the company, we chose to quantify the industry's normalized attention by apply in Equation 1 using retweets for the variable metric. In Equation 1 we use the total retweets of a given tweet in the metric variable.

In Figure 4 we reveal the normalized attention and we notice that there is not any industry with a sustained level of average attention during the first seven months of 2017. However, we observed that Beverage and Food industry in January and February have a high level of normalized attention, and Retail industry represented by "Almacenes Tia" have a high peak of normalized attention in July.

Previous studies have shown that a higher level of activity do not necessarily correspond to a higher level of online attention (Vaca Ruiz et al., 2014). We observe that such pattern is also reflected in Ecuadorian Companies.

Facebook

We also analyze the posts published in the public Facebook pages the 32 firms during 2017. In Figure 5 we present the activity on Facebook of each industry. The Automobile industry has the highest level of activity, being March the month with more posts in Facebook. There are other industries like Retail, Banking and Entertainment with more posts on March than the other months. In contrast, the Food and Beverage and Telecommunication industries has the lowest activity of the nine sectors.

We chose the Likes metric to calculate the normalized attention in an industry. In Equation 1 we use the total likes of a given post in the metric variable. Figure 6 shows the normalized attention of each industry in 2017. The Automobile industry and the Telecommunication industry have the highest level of normalized attention. Instead of this, the Food and Beverage industry and Restaurant industry have the lowest normalized attention.

We can see several differences between two figures of each SNS, and conclude that there are not patterns between the social activity of monthly posts and the normalized attention measured by the average likes and retweets in an industry. Based on the related work (Section II) we test the hypothesis that the six social media metrics: average likes, average shares, average retweets, average favorites and total followers; individually are positively correlated with the six financial metrics: assets, equity, cash, revenue, profit and advertising.

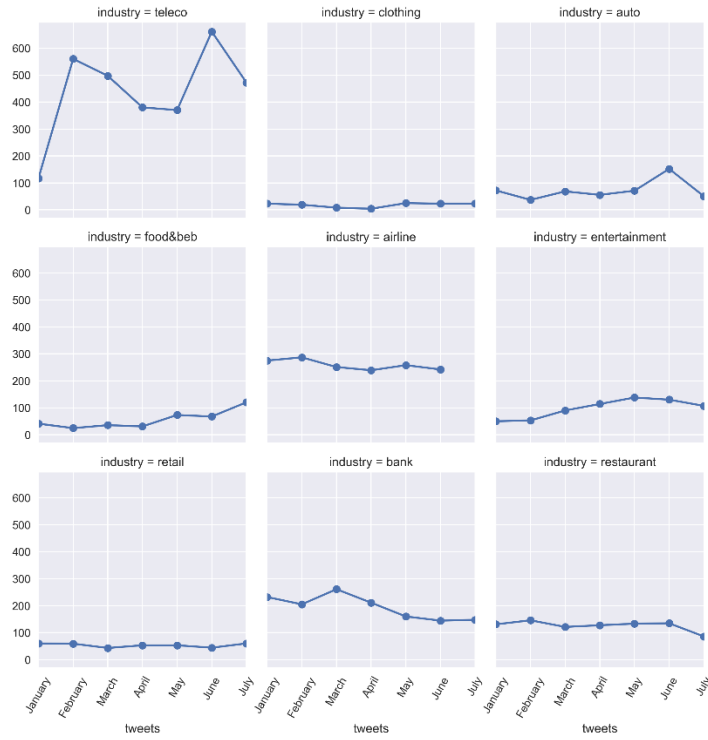


Figure 3: Activity in Twitter
 Number of tweets that show the activity of each industry that had during the 7 months the 2017

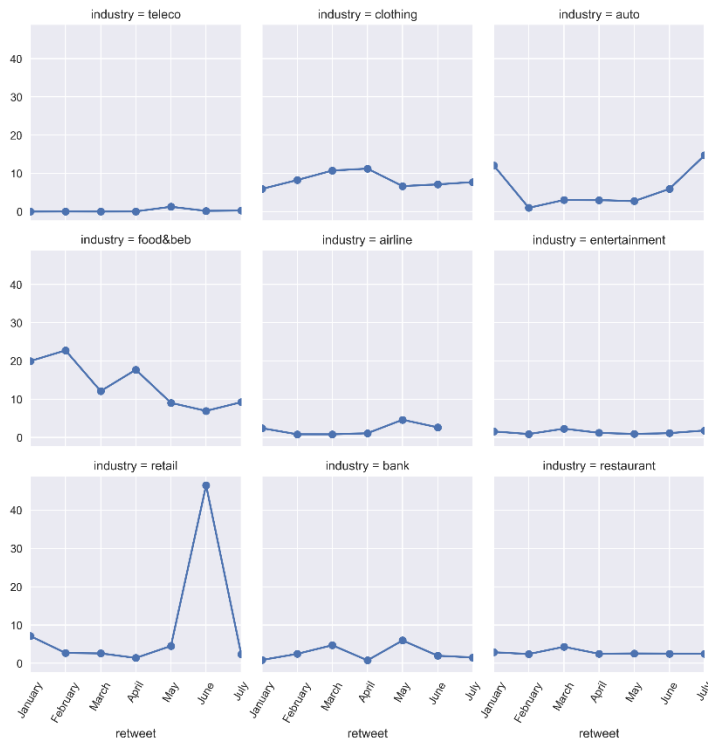


Figure 4: Normalized Attention in Twitter
 Number of average re-tweet that show the level of attention that had each industry during the 7 months the 2017

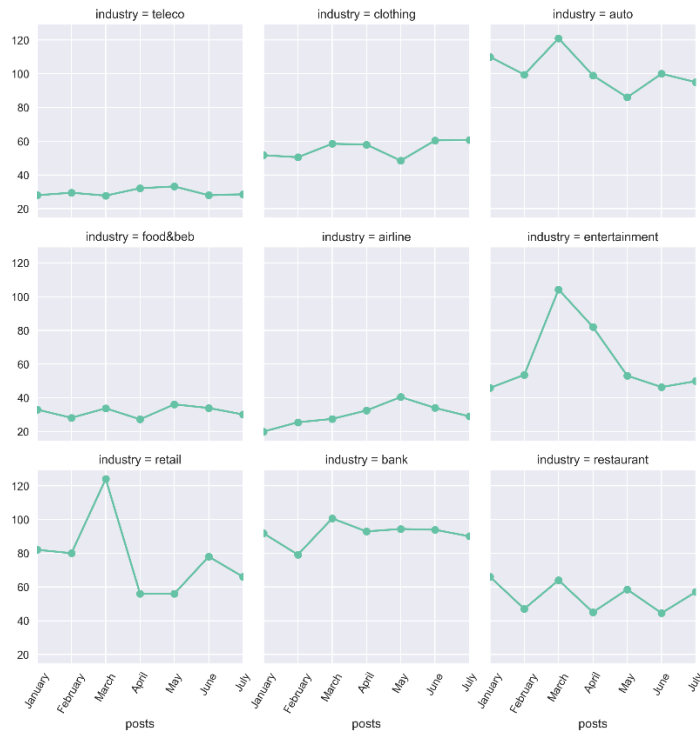


Figure 5: Activity in Facebook

Number of posts (Facebook) that show the activity of each industry that had during the 7 months the 2017

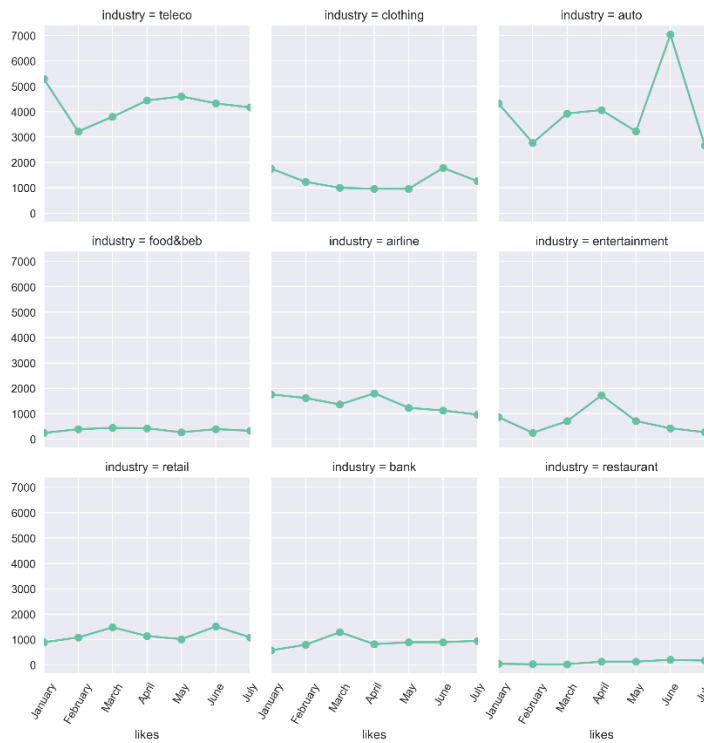


Figure 6: Normalized Attention in Facebook

Number of average likes that show the level of attention that had each industry during the 7 months the 20

VI. RESULTS

Correlation Analysis

H1. Average Likes. We correlated the average likes per firm with each financial metric and found that in the six cases there is a positive correlation. We obtained $r = 0.61$ for Assets and Equity, $r = 0.54$ for Cash, $r = 0.69$ for Income, $r = 0.63$ for Profit and $r = 0.70$ for Ads.

H2. Average Shares. We correlated the average shares per firm with each financial metric and found that in the six cases there is a positive correlation between them. We obtained $r = 0.45$ for Assets and Equity, $r = 0.49$ for Cash, $r = 0.57$ for Income, $r = 0.50$ for Profit and $r = 0.61$ for Ads.

H3. Followers Facebook. We correlated the followers of Facebook of each firm with each financial metric. There was no correlation in any case except with Advertising expenditure, obtaining $r = 0.48$. It is a well-known phenomenon that the number of followers do not correlate well with influence on financial performance (Cha et al., 2010).

H4. Average Retweets. We correlated the average retweets per firm with each financial metric. There was no correlation for any of the firms.

H5. Average Favorites. We correlated the average favorite per firm with each financial metric. There was no correlation in any case.

H6. Followers Twitter. We correlated the followers of Twitter of each firm with each financial metric. There was no correlation in any case.

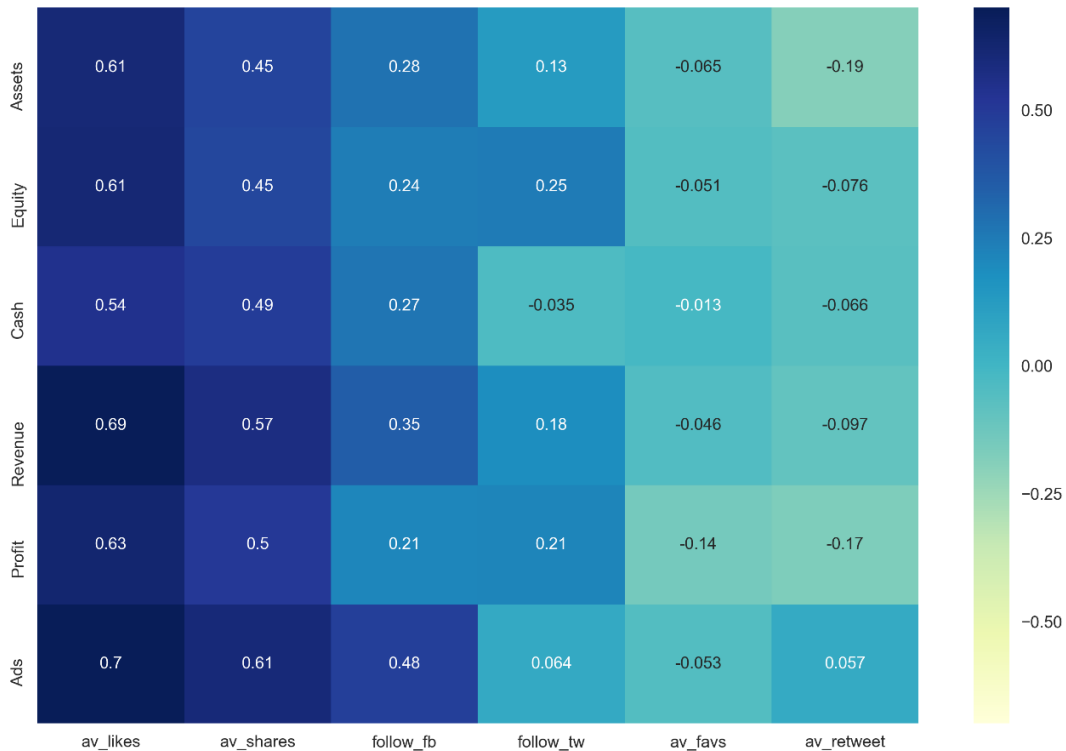


Figure 7: Spearman Correlation heatmap

Spearman's correlation between financial indicators and social media metrics of Ecuadorian companies

We learned through the analysis (H4, H5) that for Ecuadorian audience the attention obtained in Facebook is notoriously higher but also it reflects better the financial performance of the company than the activity in Twitter.

All the attention metrics and financial indicators are log-transformed, to counter for skewness before any calculation of correlations. The results obtained are statistically significant, at least with p -value < 0.05 . In Figure 7 there is a Heat Map of the correlations between attention metrics and financial metrics. Through the analysis we observed that the correlation between financial performance and the banks was really poor. Therefore, we removed the Banking industry from the analysis, its social attention is not very strong in the Ecuadorian market. We can conclude that attracting social attention is not a priority for Ecuadorian Banking.

Analyzing Facebook's social attention, the Advertising Expenditure has the highest correlation with attention metrics. Specially for likes and shares the correlation is 0.7 and 0.61 respectively. For Revenue there is also high correlations with likes and shares, specifically 0.69 and 0.57. This supports previous findings in the literature about the relationship between social attention and the financial performance of a firm.

Regression Analysis

For a more precise measure of the relationship among the variables, a regression analysis is expressed in Equation 3. Particularly, Model 1 defines the revenue of a company as the dependent variable and the average likes for the independent variable, as we show in Equations 4. Model 2 is defined in Equation 5 using the revenue of a company for the dependent variable and the average shares for the independent variable.

$$Revenue_i = \alpha_0 + \alpha_1 av_likes_i + \epsilon_i \quad (4)$$

$$Revenue_i = \beta_0 + \beta_1 av_shares_i + \epsilon_i \quad (5)$$

In Table 3 we showed the results for the regression analysis. The variables are log-transformed to correct skewness and the banking and retail industries were separated from the sample. The results revealed are statistically significant, at least with p -value < 0.01 . We selected av_likes and av_shares as independent variables for own model predictive since those are the variables with a higher correlation results.

In the case of the Model 1 (Equation 4) where the normalized attention metric is the average likes per post, if the average likes changes by one percent, we would expect the revenue to change by 0.74%. In Model 2 (Equation 5) if the average shares changes by one percent, we would expect the revenue to change by 0.64%. Finally, the Adjusted R^2 is much better in Model 1, with 0.40, than Model 2, with 0.28.

	<i>Model 1</i>	<i>Model 2</i>
av_likes	0.7452*** (0.149)	-
av_shares	-	0.6456** (0.166)
constant	14.062*** (0.964)	16.238*** (0.702)
Adjusted R^2	0.43	0.31
n	27	27
F-statistic	25.06	15.14

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Robust standard errors used in linear regressions

Table 3: Linear Regression Models

VII. CONCLUSIONS

The evidence from this study points towards the idea that there is a relationship between social attention metrics and the financial performance of a firm. Our findings are in line with previous results even when there is not available stock data for Ecuador to make statistical analysis. We are aware that our research may have two limitations. The first is that it is not always easy to find the financial metrics of a specific brand in companies that agglome has a lot of them. The second is that stock market data could be a more reliable metric to measure the financial performance.

Unlike other research carried out in this area, we did not find a significant correlation between Twitter metrics and financial indicators. This apparent lack of correlation can be attributed to the fact that Ecuadorian consumers are not highly connected to this social network. Apparently, Facebook could be a most powerful and effective tool to reach and engage new customers.

We have confirmed that Facebook metrics have relationship with financial metrics, specially revenue and advertising expenditure. We also propose a specific model to study the relationship between the revenue and Facebook metrics, given certain conditions. This cutting-edge model for firm's valuation is still developing new practical and theoretical implications, so to further our research we plan to make a sentiment analysis to the comments and tweets of this SNS and financial performance of firms.

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