



UNIVERSIDADE CATÓLICA PORTUGUESA

Unveiling the impact of annual reports' tone on valuation

Leveraging net tone as a key investment factor

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Católica Porto Business School

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Resumo

Esta dissertação foca-se no desenvolvimento de uma estratégia de investimento que se baseia nas mudanças do tom narrativo dos relatórios anuais entre anos consecutivos. A abordagem envolve a compra de ações que exibem mudanças positivas no tom líquido e a venda daquelas que mostram mudanças negativas no tom. Através da implementação de um conjunto de análises empíricas, conclui-se que esta estratégia específica mostra-se financeiramente vantajosa. Especificamente, a aplicação de portfólios ponderados por valor resultou na identificação de alfas que variam de 0,49% a 0,68%, demonstrando o potencial de rentabilidade. Por outro lado, no caso dos portfólios igualmente ponderados, a faixa de alfas descoberta fica entre 0,74% e 0,88%, destacando ainda mais a viabilidade e eficácia desta estratégia.

Palavras-chave: avaliação de ativos, desempenho, retorno, relatório anual, tom líquido, mudança de tom líquido, positivo, negativo.

Abstract

This thesis delves into the development of a trading strategy that is founded upon the fluctuations in the narrative tone of annual reports between consecutive years. The approach involves purchasing stocks exhibiting positive shifts in net tone while selling those displaying negative changes in tone. Through the implementation of a diverse array of empirical analyses, it can be deduced that this particular strategy proves to be financially advantageous. To be more specific, the application of value-weighted portfolios has resulted in the identification of alphas that span from 0.49% to 0.68%, showcasing the potential for profitability. Conversely, in the case of equally-weighted portfolios, the range of alphas discovered falls between 0.74% and 0.88%, further underscoring the viability and effectiveness of this trading strategy.

Keywords: asset pricing, performance, return, annual report, net tone, net tone change, positive, negative

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Introduction

Corporate disclosure, particularly through annual reports, serves as a cornerstone in corporate finance theory, providing vital information to investors and analysts. While traditional research mainly focused on quantitative financial data, recent studies have increasingly recognized the significance of qualitative information embedded within corporate communications. This dissertation delves into the impact of narrative tone in annual reports on investors' decisions, seeking to bridge the gap between qualitative and quantitative analysis in investment strategies.

The motivation behind this study stems from the evolving landscape of financial markets, where investors are increasingly recognizing the importance of qualitative factors alongside traditional quantitative metrics. Despite the prevalence of sentiment analysis and textual data mining techniques, there remains a dearth of structured methodologies incorporating these elements into investment strategies. This study aims to address this gap by examining the influence of narrative tone in annual reports on investment decisions, thereby contributing to a more comprehensive understanding of the factors driving market outcomes.

The core strategy employed in this dissertation revolves around analyzing the net tone change in annual reports of non-financial companies listed in the FTSE350 index from April 2009 to April 2018. The rebalancing process occurs annually in April as most companies disclose their annual reports around this time of the year, facilitating informed decision-making during this period. The

portfolios, equally weighted and value-weighted, are constructed based on companies exhibiting positive or negative net tone variations. The performance of these portfolios is compared against the FTSE350 index, and various regression models, including CAPM, FF3, FF3 + Momentum, FF5, and FF5 + Momentum, are employed to evaluate portfolio returns and risk-adjusted performance.

The analysis reveals that portfolios constructed based on the net tone change of annual reports consistently outperform the market, as indicated by higher Sharpe ratios (EWP: 0.49%; VWP: 0.22%; FTSE 350: 0.17%). Significant alphas are observed in both equally weighted (0,74% - 0,88%) and value-weighted portfolios (0,49% - 0,68%), particularly in the equally weighted portfolio. This suggests that the strategy of buying stocks with positive net tone variations and selling negative ones generates abnormal returns, highlighting the efficacy of incorporating narrative tone analysis into investment decisions

Comparing the findings of this study with existing literature reveals intriguing insights. For instance, Loughran and McDonald's (2016) seminal survey on textual analysis in accounting and finance provides a comprehensive overview of how sentiment and tone extracted from financial reports can inform investment decisions, setting a foundational context for this study within the broader landscape of textual analysis research. Additionally, Davis, Piger, and Sedor's (2012) investigation into the effects of optimistic and pessimistic language in earnings press releases corroborates the significance of narrative tone by demonstrating its measurable impact on investor perceptions and market outcomes. Their study reveals that optimistic language tends to elicit more positive investor reactions, leading to higher stock prices, while pessimistic language has the opposite effect, suggesting that narrative tone influences investor reactions and market outcomes (Davis et al., 2012). Furthermore, Tetlock's (2007) research on media sentiment's influence on stock

market returns provides an additional perspective on how public information and its tone can affect market behavior, complementing this study's focus on the impact of annual report characteristics on investment decisions. Tetlock found that media sentiment significantly predicts market returns, indicating that sentiment conveyed through various channels can influence investor sentiment and subsequent market movements (Tetlock, 2007). Moreover, Huang, Teoh, and Zhang's (2014) examination of tone management underscores the relevance of discussing how companies might strategically manage narrative tone to influence investor expectations, thereby enhancing the transparency of financial communications. Their study suggests that firms actively manage the tone of their disclosures, with implications for investor reactions and market perceptions (Huang et al., 2014). The results of this dissertation emphasize the significance of narrative tone in shaping investors' decisions and portfolio performance, aligning with the growing body of literature emphasizing the role of qualitative analysis in investment strategies.

This dissertation is structured as follows: Chapter 2 delves into the Literature Review, discussing existing research on corporate disclosure, qualitative data analysis, and its implications for investment strategies. Chapter 3 details the Methodology, including sample selection, data collection, portfolio construction, and regression analysis. Chapter 4 presents the Results, showcasing the findings of the analysis and their implications for investment decision-making. Finally, Chapter 5 concludes the study by summarizing the key findings, discussing their significance, and suggesting avenues for future research. Through this structured approach, this dissertation aims to contribute to the evolving discourse on the integration of qualitative factors in investment strategies, thereby enriching our understanding of market dynamics and enhancing investment outcomes.

Chapter 2

Literature review

Corporate disclosure, a critical subject in corporate finance theory, acts as the primary source of information for investors and analysts according to Previt et al. (1994). Originally, research primarily focused on financial reporting, paying less attention to qualitative data like CEO's letters to shareholders, MD&A, conference calls, or interviews. The preference for quantitative financial and accounting data in the early stages of study was driven by its easier accessibility and lower controversy. Nonetheless, research by Shiller (1981) and Roll (1988) reveals that stock prices are not solely influenced by quantitative data but also by qualitative information.

In the realm of qualitative data, there are two types that can significantly impact stock prices and how a firm's value is perceived by stakeholders. Tetlock (2007; 2008) delves into the effects of external entities like media agents on a firm. However, this dissertation concentrates on the influence of insider communication, particularly on annual reports. Analyzing the characteristics of this communication holds immense significance. Bens and Monahan (2004) demonstrate that high-quality financial disclosures possess the ability to diminish information asymmetries and enhance market efficiency.

Traditionally, stakeholders rely on financial (numerical) data to forecast and evaluate a firm's quality and future performance. Nevertheless, annual reports encompass both numerical and textual information, comprising CEO's letters to

shareholders, MD&A, and financial information notes that not only complement numerical data but also convey the company's future expectations.

Verrecchia (1983) stresses that company disclosures aid investors in predicting the future, indicating that financial models alone, such as DCF models, are inadequate for valuing a company. Additional factors, like linguistic attributes in the annual report, could impact a firm's performance (Li, 2008).

Several linguistic characteristics present in the annual report have the potential to impact investors, including factors such as readability and the tone set by management. According to Henry (2008), the tone utilized in these reports plays a significant role in shaping investors' responses to earnings announcements, with the sophistication level of investors also being a relevant factor to consider. It is posited that investors with higher levels of education may be less susceptible to manipulation through the use of linguistic techniques within these reports. Li (2008) further expounds on this by pointing out a discernible correlation between the linguistic attributes found in annual reports and the overall performance of the firm, indicating that companies with more easily understandable reports often exhibit more consistent positive earnings. The concerns surrounding the ability of small-scale investors to comprehend intricate financial documents, as highlighted by the Securities and Exchange Commission (SEC) in 1998 and Cox in 2007, serve as the driving force behind the initiation of this study, aiming to delve into the impacts of management tone within the annual reports.

In a study conducted by Karapandza (2016), an investigation into the relationship between stock returns and the usage of future tense language in 10-K reports was undertaken. The findings from this research reveal that companies employing a greater degree of future tense language tend to witness higher stock returns in the future, thereby indicating that linguistic cues

embedded within financial reports hold the potential to forecast market movements.

Prior literature has tended to overlook the significance of management tone, instead focusing more prominently on factors such as document length or readability. This oversight implies that the linguistic attributes of annual reports could potentially serve as a crucial variable within asset pricing models, given their correlation with the performance of the firm. Sabri (2019) studies the impact of annual report readability and concludes that less readable annual reports hinder investors' ability to process information, reducing willingness to trade and decreasing stock liquidity.

This dissertation aims to fill a significant void in the existing body of literature by delving into the underexplored potential of annual report attributes, specifically focusing on tone, as critical components in the decision-making processes related to investments. Despite the increasing acknowledgment of non-traditional factors in financial evaluations, such as sentiment analysis and textual data mining, there is a noticeable absence of a structured amalgamation of these elements into investment methodologies (Smith et al., 2020). Even as conventional financial indicators continue to hold sway over investment approaches, the substantial wealth of information embedded within annual reports has frequently been disregarded as a fount of valuable perspectives into the performance, future prospects, and managerial sentiments of companies (Li et al., 2017). Consequently, the primary objective of this study is to bridge this void by presenting empirical substantiation and conceptual frameworks that underline the significance of tone assessment in annual reports as a prognostic instrument for investment consequences (Zhang & Zhou, 2019). Through a careful scrutiny of linguistic structures and emotional expressions, this study seeks to illuminate the transformative capacity of textual data analysis in reshaping investment paradigms and cultivating more

enlightened decision-making practices within the financial sphere (Feng et al., 2018).

The notion of tone denotes the affective impact of communication (Henry 2008). In the context of this investigation, tone within the annual report signifies how managerial communications to shareholders affect them emotionally or the repercussions it generates. Net tone is categorized into positive and negative dimensions. Positive tone encompasses terms that evoke trust, contentment, or satisfaction like 'achieved,' 'glad,' 'growth,' 'luckily,' among others. Conversely, negative tone might trigger worry, resentment, or displeasure among shareholders, with words such as 'unfortunately,' 'weak,' and 'uncertain' provoking unfavorable reactions.

The utilization of a positive tone in disclosures is a prevalent tactic to elicit a favorable response from investors towards annual reports. Nonetheless, it is imperative to recognize that this strategy may not always yield the desired results, especially when a company is facing financial instability. During such circumstances, it becomes crucial to prioritize integrity and openness in financial disclosures, as deceptive or excessively optimistic language could erode investor confidence. Finding a middle ground between providing an unbiased assessment of financial performance and crafting messages that resonate with investors is paramount. This equilibrium empowers organizations to maintain their credibility during challenging periods while fostering trust among stakeholders.

Chapter 3

Methodology

3.1. Data

The sample selection for this dissertation consists of using all non-financial companies included in the FTSE350 for each year of the sample period (2009-2018). The FTSE350 is a market index comprising the 350 largest companies listed on the London Stock Exchange, ranked by market capitalization. Therefore, the FTSE350 provides a broad view of the UK stock market, including companies from various sectors and industries. This index is widely used by investors and analysts to track the performance of the British stock market and as a benchmark for evaluating the performance of investment portfolios and mutual funds. Financial companies are excluded from this study due to the specialized language used in their reports, and stringent regulatory requirements that may limit the expression of sentiment. Additionally, the performance of financial institutions is heavily influenced by macroeconomic factors and regulatory changes, diminishing the relative impact of sentiment expressed in annual reports. As a result, investors in financial firms typically rely more on quantitative metrics and market indicators rather than qualitative sentiment analysis when making investment decisions.

The choice for the sample period is related to the availability of net tone data for the companies selected. Regarding this textual variable, it is calculated according to Henry (2006) dictionary. To measure net tone, they employ sentiment analysis techniques to calculate the net tone of these releases. This involves assessing the sentiment conveyed in the text by assigning numerical scores to words and phrases, with positive scores indicating a positive sentiment and negative scores indicating a negative sentiment.

$$(i) \text{ Net tone} = \frac{\# \text{ positive words} - \# \text{ negative words}}{\# \text{ positive words} + \# \text{ negative words}}$$

For this study, the variable considered is the net tone change based on the annual report of the previous year.

$$(ii) \text{ Net tone change} = \text{Net tone}_n - \text{Net tone}_{n-1}$$

The descriptive statistics of such variable is as follows:

	2010	2011	2012	2013	2014	2015	2016	2017	2018
# observations	210	202	208	209	206	201	199	189	176
Mean	0,05	0,02	-0,01	-0,02	-0,01	-0,04	-0,02	0,01	0,00
Std. Dev.	0,14	0,13	0,12	0,12	0,10	0,09	0,08	0,08	0,07
Min.	-0,50	-0,36	-0,55	-0,72	-0,48	-0,36	-0,32	-0,32	-0,22
Median	0,05	0,01	0,00	-0,02	-0,01	-0,03	-0,01	0,00	0,01
Max.	0,47	0,71	0,55	0,44	0,34	0,24	0,20	0,26	0,28

Table 1: Net tone change descriptive statistics

Using Refinitiv Eikon DataStream, the companies present in the FTSE350 index for each year were extracted. Unfortunately, not every company had a net tone variable, so the sample ended up being constituted by 307 companies from the 572 possible ones across the whole period. The study consists of yearly rebalancing the portfolios based on available net tone data. The monthly return

index for each company was considered followed by the calculation of returns (in percentage) to proceed with the rebalancing exercise.

The sample ended up with 23484 observations, 12 returns for each company in each throughout the 9 years.

To validate this analysis, 30 regressions were performed: CAPM, FF3, FF3 + momentum, FF5, FF5 + momentum. The factors for this analysis were extracted from Keneth and French library and from the website UK DataService reshare. The latter only had data for SMB and HML factors as well as the risk-free rate from the beginning of our analysis period until June 2016. For the remaining data, European data from Keneth and French library was used as a proxy given that the two databases have such high correlation as demonstrated by the graphic below comparing the market risk premiums.

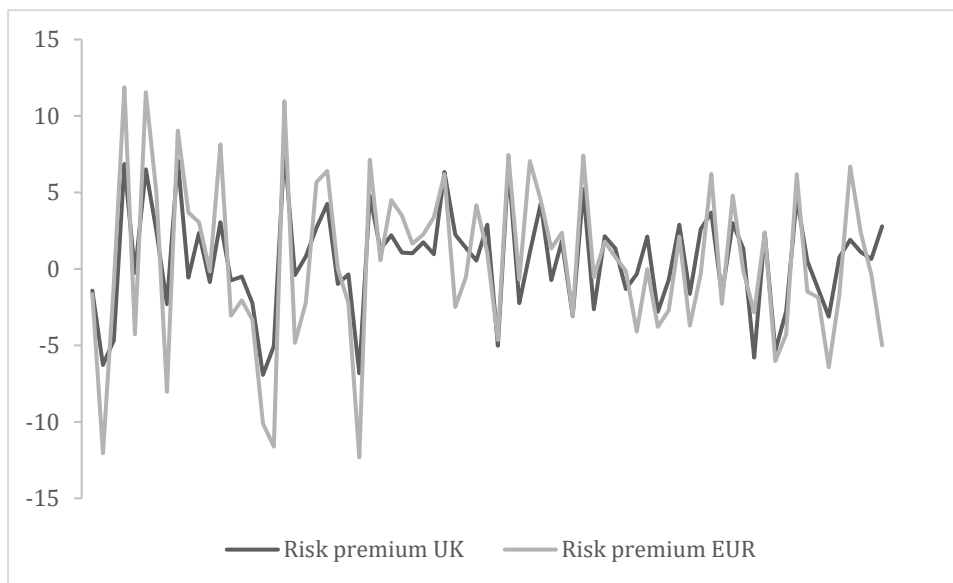


Figure 1: Risk premium correlation between UK and Europe markets

Description: This figure aims to illustrate the close correlation between UK and EU risk premium along the period under analysis.

The correlation coefficient of 0.64 indicates a moderately strong positive relationship between the risk premium rates of the US and Europe during the period from April 2010 to March 2019. This suggests that, in general, when the

premium in one region increased, the premium in the other region tended to increase as well, and vice versa. However, it is noteworthy that correlation does not imply causation. Other factors such as economic conditions, monetary policy decisions, inflation rates, and geopolitical events could have influenced both the US and European risk premium during this time frame.

3.2. Research design

This dissertation studies the impact of narrative tone in annual reports in investors' decisions. This analysis consists of rebalancing the investment strategy every year, from 2010 to 2018, considering the net tone change of each company from the sample. Two portfolios were built: an equally weighted portfolio and a value-weighted portfolio. Equally weighted and value-weighted methodologies differ in how they assign weights to individual components within an index or portfolio. Equally weighted approaches allocate the same weight to each component, promoting diversification and reducing the influence of any single stock. Conversely, value weighting assigns weights based on market capitalization, with larger companies exerting greater influence due to their higher market caps. While equally weighted strategies offer broad exposure across all holdings, value weighting reflects the market's valuation of each company, potentially leading to a concentration in larger firms. Ultimately, the choice between equally weighted and value-weighted strategies depends on factors such as investment goals, risk tolerance, and market conditions, each offering distinct advantages and considerations for investors. It is important to note that the construction of value-weighted portfolios was made only at the beginning of each year, not having been rebalanced throughout the years.

This strategy consisted of assessing if the net tone change was positive or negative. In the case of a positive net tone change, it was assumed that investors would buy the stock, otherwise they would sell it or not buy it. In this sense for each portfolio type, it was analysed the portfolio of companies' shares to be bought ("Buy"), the portfolio of companies' shares to be sold ("Sell"), and then a net portfolio to assess the real return of an investor if this strategy was implemented ("Buy-Sell").

This rebalancing process took place every year in April. The decision to do it in April has to do with the fact that most English companies release their annual reports around that time of the year. This controls for immediate effects of positive or negative net tones in the market. However, due to research limitations, it is not possible to assert the specific time on which companies are releasing their annual report.

The variable considered to calculate portfolio performance was the return index, extracted from Refinitiv Eikon DataStream.

To analyse the performance of each portfolio, a set of regressions were calculated using different asset pricing models.

The Capital Asset Pricing Model (CAPM), introduced by Sharpe (1964) Lintner (1965), forms the basis of modern asset pricing theories. It assumes investors are rational and risk-averse, forming portfolios along the efficient frontier. However, criticisms have led to the development of alternative models.

$$(iii) \quad E(ri) - rf = \alpha + \beta i(\text{Market Risk Premium}) + \epsilon i$$

The Fama-French three-factor model, proposed by Fama and French (1993), extends CAPM by adding size and value factors. Smaller companies and undervalued stocks tend to outperform, challenging CAPM's assumptions about market beta and expected returns.

$$(iv) \quad E(r_i) - r_f = \alpha + \beta_i(\text{Market Risk Premium}) + \beta_i(\text{SMB}) + \beta_i(\text{HML}) + \epsilon_i$$

The Carhart four-factor model, introduced by Carhart (1997), incorporates momentum as a fourth factor alongside market risk, size, and value. Momentum acknowledges stocks' past performance in predicting future returns.

$$(v) \quad E(r_i) - r_f = \alpha + \beta_i(\text{Market Risk Premium}) + \beta_i(\text{SMB}) + \beta_i(\text{HML}) + \beta_i(\text{WML}) + \epsilon_i$$

Fama and French (2015) further expanded their model to the five-factor model. It includes profitability and investment factors alongside market risk, size, and value. This model provides a more comprehensive explanation of asset returns and has been validated internationally.

$$(vi) \quad E(r_i) - r_f = \alpha + \beta_i(\text{Market Risk Premium}) + \beta_i(\text{SMB}) + \beta_i(\text{HML}) + \beta_i(\text{RMW}) + \beta_i(\text{CMA}) + \epsilon_i$$

Furthermore, it was decided to incorporate momentum factor in the previous model.

$$(vii) \quad E(r_i) - r_f = \alpha + \beta_i(\text{Market Risk Premium}) + \beta_i(\text{SMB}) + \beta_i(\text{HML}) + \beta_i(\text{RMW}) + \beta_i(\text{CMA}) + \beta_i(\text{WML}) + \epsilon_i$$

Chapter 4

Results

4.1. Portfolio performance and benchmark

When comparing the equally weighted portfolio (EWP) and the value-weighted portfolio (VWP) within the context of our strategy several considerations arise. The "Buy" portfolio represents the stocks that were bought, the "Sell" portfolio consists of stocks that were sold, and the "Buy-Sell" portfolio reflects the difference between these two.

The analysis reveals that our strategy consistently outperforms the market, as evidenced by both the EWP and VWP generating higher monthly Sharpe ratios compared to the FTSE 350 (EWP: 0.49%; VWP: 0.22%; FTSE 350: 0.17%). This suggests that companies exhibiting positive net tones tend to outperform those with negative tones while also exhibiting lower risk profiles.

Moreover, the table suggests that considering net tone change could be more effective when buying stocks than when selling. In other words, positive net tone change can be more indicative of better performance of the companies than the negative tone change.

Notably, when comparing the performance of the EWP and VWP, the EWP demonstrates superior performance over the analysed period. This outcome is attributable to the construction of the VWP, which weights companies based on their size, resulting in larger companies carrying more weight in the portfolio.

Thus, our findings underscore the efficacy of our strategy in leveraging positive net tone variations to achieve market-beating returns while mitigating risk.

%	EWP			VWP			FTSE350
	Buy	Sell	Buy-Sell	Buy	Sell	Buy-Sell	
Returns	1,24	0,41	0,83	0,90	0,33	0,57	0,63
Standard deviation	3,80	4,00	1,59	3,78	4,20	2,33	3,44
Sharpe ratio	0,31	0,09	0,49	0,23	0,07	0,22	0,17

Table 2: Portfolio performance and benchmark

Average monthly return, standard deviation and Sharpe ratio were calculated based on the following equations:

$$(xi) \frac{\sum_{i=1}^n Ri}{n}$$

Where:

- i. Ri represents the return of each individual observation.
- ii. n is the total number of observations.

$$(xii) \sqrt{\frac{\sum_{i=1}^n (Ri-R)^2}{n}}$$

Where:

- i. Ri represents the return of each individual observation.
- ii. R is the average return (mean).
- iii. n is the total number of observations.

$$(xiii) \frac{Rp-Rf}{\sigma p}$$

Where:

- iv. Rp is the average return of the portfolio.
- v. Rf is the risk-free rate.
- vi. σp is the standard deviation of the portfolio's returns.

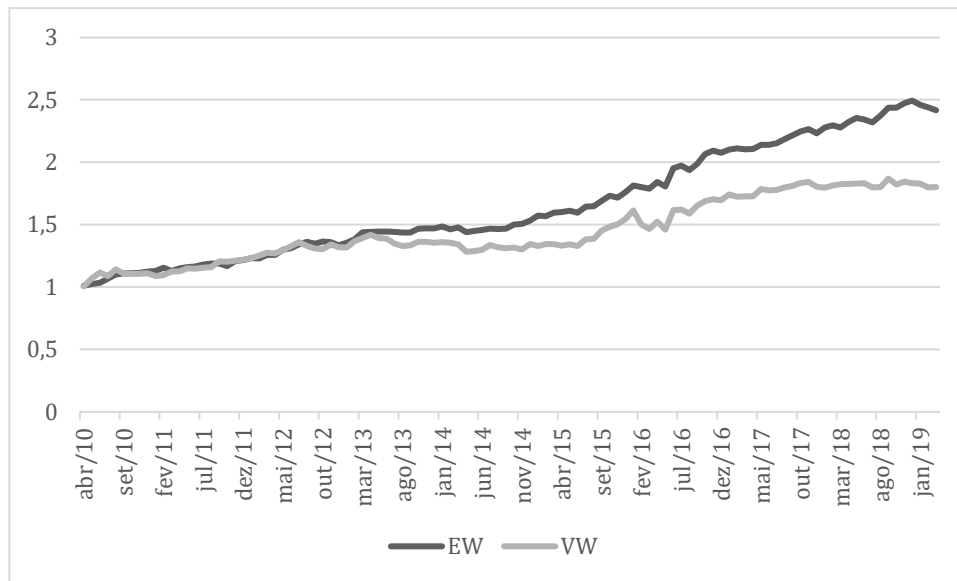


Figure 2: Money evolution of EW portfolio and VW portfolio

Description: This graphic shows the evolution of 1 euro investment in each portfolio constructed. It indicates that equally-weighted portfolio is more profitable than value-weighted portfolio.

4.2. Regression analysis

4.2.1. CAPM

The table below presents the results of the estimation of the CAPM model, formulated by Sharpe (1964) and Lintner (1965), and later developed by Jensen (1968), for the different value-weighted and equally weighted portfolios, based on monthly returns during the period from April 1st, 2010, to March 31st, 2019.

	EWP			VWP		
	Buy	Sell	Buy-Sell	Buy	Sell	Buy-Sell
α	0,65***	-0,2	0,85***	0,33	-0,32	0,64***
β	0,88***	0,91***	-0,03	0,86***	0,97***	-0,11*
R^2	0,6	0,58	0,005	0,58	0,6	0,03
F	160,26	148,95	0,49	144,58	159,2	2,91

Table 3: CAPM regression analysis

Notes: *** represents p-values <0.01, ** represents p-values <0.05, and * represents p-values <0.10

In terms of CAPM regressions, it is important to bear in mind that the model has proven limitations and is not solely sufficient to draw conclusions. The low R^2 value suggests that the regression model can only explain 3% of net returns variability for VWP and only 0.4% for EWP.

However, the “Buy-Sell” portfolios present positive and significant alphas which leads to the conclusion that the strategy can generate abnormal returns when based on the net tone change of annual reports. On the other hand, it is possible to observe that the market betas coefficient suggests that the EWP has no additional systematic risk and for the VWP it is possible to obtain hedging against systematic risk.

The most notable takeaway from this regression analysis is the magnitude of the alphas discovered, particularly for EWP, showcasing 0.85% of abnormal returns, potentially exceeding more than 10% annually, highlighting that the “Buy” portfolio contributes more for these results than the “Sell” portfolio in EWP. In VWP, the portfolios have a more even contribution and the abnormal return is still very big (0.64%).

4.2.2. Fama-French three-factor model

The following table presents the results of the estimation of the three-factor model, formulated by Fama and French (1993), presented for the different value-weighted and equally weighted portfolios. The estimation was based on monthly returns during the sample period from April of 2010 to march of 2019.

Regarding the variables presented by the CAPM model, the behaviour remains unchanged, with still positive and significant alphas for (“Buy-Sell”) portfolio and the same results for the market beta. It is important to note that R^2 indicates that the model can explain between 12% to 13% of the variability of our results.

	EWP			VWP		
	Buy	Sell	Buy-Sell	Buy	Sell	Buy-Sell
α	0,56***	-0,32	0,88***	0,37	-0,32	0,68***
β	0,92***	0,95***	-0,04	0,86***	0,97***	-0,11*
SMB	0,26***	0,47***	-0,21***	-0,3***	-0,04	-0,26***
HML	-0,08	-0,01	-0,07	-0,15	-0,06	-0,09
R^2	0,63	0,67	0,13	0,63	0,6	0,12
F	60,05	71,81	5,07	57,86	52,37	4,55

Table 4: FF3 regression analysis

Notes: *** represents p-values <0.01, ** represents p-values <0.05, and * represents p-values <0.10

For the EWP, a monthly alpha of 0.88% is generated, which is very significant and still indicative of strong capacity in generating abnormal returns. The buy portfolio contributes circa 64% to these results. Moreover, the strategy has no exposure to market or value factors. The negative coefficient of SMB indicates that the strategy has an implicit bet on big firms.

The VWP has pretty similar results with smaller alpha but still very significant and both “Buy” and “Sell” portfolios contribute equally. Additionally, it is possible to state that the low marginal significant negative beta suggests a hedged position on systematic risk.

In this assessment, the strategy has no exposure to the value factor for both portfolios.

4.2.3. Carhart model

Table 4 presents the results of the estimation of the four-factor model, formulated by Carhart (1997), estimated for the different value-weighted and equally weighted portfolios, based on monthly returns during the sample period.

	EWP			VWP		
	Buy	Sell	Buy-Sell	Buy	Sell	Buy-Sell
α	0,73***	-0,01*	0,74***	0,47***	-0,05	0,52**
β	0,91***	0,94***	-0,03	0,86***	0,97***	-0,11*
SMB	0,23**	-0,41***	-0,18***	-0,32**	-0,09	-0,23***
HML	-0,18	-0,2*	0,019	-0,21	-0,23	0,01
WML	-0,18**	-0,34***	0,15***	-0,11	-0,30***	0,19**
R ²	0,65	0,72	0,19	0,63	0,63	0,15
F	47,4	65,6	5,88	43,94	44,05	4,65

Table 5: Carhart regression analysis

Notes: *** represents p-values <0.01, ** represents p-values <0.05, and * represents p-values <0.10

Regarding the analysis, it is possible to identify the same pattern as the previous analysis, although with smaller alphas. The contribution of the “Buy” portfolio is the most significant in both portfolios.

For the EWP, the strategy has no exposure to systematic risk, since the beta coefficient is not significant. However, for VWP, the strategy could serve as a hedge against systematic risk.

The SMB negative and significant coefficients of both portfolios indicate that the strategy has an implicit bet on big companies.

The momentum factor (WML) presents a positive and significant coefficient for both portfolios. This suggests that the strategy has an implicit bet on companies that performed better over time. This result confirms that the annual report net tone change is a good factor for the performance assessment of the firm while making investment decisions.

Lastly, it is highlighted that the R² increased with this model to 19% for EWP and 15% for VWP.

4.2.4. Fama-French five factor model

Table 5 presents the results of the estimation of the five-factor model, formulated by Fama and French (2015), estimated for the different value-weighted and equally weighted portfolios, based on monthly returns during the sample period.

	EWP			VWP		
	Buy	Sell	Buy-Sell	Buy	Sell	Buy-Sell
α	0,55**	-0,29	0,85***	0,33	-0,26	0,59**
β	0,92***	0,94***	-0,01	0,87***	0,97***	-0,10
SMB	0,26**	0,44***	-0,18***	-0,28***	-0,07	-0,21**
HML	-0,11	0,02	-0,14	-0,12	-0,11	-0,01
RMW	0,004	-0,06	0,06	0,10	-0,14	0,24
CMA	0,15	-0,25	0,40***	0,04	-0,06	0,10
R^2	0,64	0,68	0,43	0,63	0,60	0,13
F	35,6	43	4,7	34,1	31	0,13

Table 6: FF5 regression analysis

Notes: *** represents p-values <0.01, ** represents p-values <0.05, and * represents p-values <0.10

In this model, it is possible to verify that all drawn conclusions until now are still valid.

The alphas of both portfolios are still very significant with EWP presenting a higher with the buy portfolio contributing more than the same one in VWP. Additionally

The conclusions regarding SMB are the same. The strategy has an implicit bet regarding big firms. The nonsignificance of HML and RMW factors shows that the strategy has no exposure to these factors.

For EWP the positive and significant coefficient shows an implicit bet on conservative companies.

Moreover, please note that for this model, it is possible to observe an increase of R^2 for EWP.

4.2.5. Fama-French five factor model + momentum

Table 6 represents the results of the estimation of the FF5 model adding a momentum factor, estimated for the different value-weighted and equally weighted portfolios, based on monthly returns during the sample period.

%	EWP			VWP		
	Buy	Sell	Buy-Sell	Buy	Sell	Buy-Sell
α	0,68***	-0,08	0,76***	0,41	-0,08	0,49**
β	0,94***	0,95***	-0,02	0,88***	0,98***	-0,11
SMB	0,27***	0,45***	-0,18***	-0,28***	-0,07	-0,21**
HML	-0,19	-0,11	-0,08	-0,17	-0,23	0,06
RMW	0,17	0,22	-0,05	0,20	0,10	0,11
CMA	0,29	-0,02	0,30**	0,13	0,13	0,00
WML	-0,22**	-0,37***	0,15**	-0,14	-0,32***	0,17*
R^2	0,65	0,72	0,23	0,63	0,63	0,16
F	31,7	43,7	5,1	29	28,9	3,1

Table 7: FF5 + momentum regression analysis

Notes: *** represents p-values <0.01, ** represents p-values <0.05, and * represents p-values <0.10

Lastly, regarding the FF5 + momentum model, there are no major changes that will alter the conclusions drawn up until now.

The alphas persistently are positive and significant, demonstrating the abnormal monthly returns that strategy can generate. Both portfolios have no exposure to systematic risk, HML, and RMW factors. However, the EWP shows an implicit bet on conservative companies given the positive and significant coefficient of the CMA factor. Both portfolios show an implicit bet on companies that performed better historically as evidenced by the positive and significant coefficient of the WML factor.

It is highlighted that R^2 indicates that the model can explain between 23% to 16% of the variability of our results.

4.3. Robustness check

The robustness check for this study was conducted by changing the sample. Instead of focusing on FTSE350 companies, the sample includes the small-cap index of the UK market, using the same time period and the same models.

One of the findings of this dissertation is that there is an implicit bet on bigger companies on this strategy. The motivation for this robustness check lies in the ability of this investment strategy to generate positive returns despite the size of the companies selected. It is important to note that we perform robustness tests only for the EWP given its more promising results.

The results were consistent with our findings. It was observed that all regressions registered a more positive and significant alpha which means that this strategy can generate abnormal returns using UK small-cap companies. However, the strategy seems to have no exposure to any of the other factors as evidenced by the non-significance of the factors considered.

These results indicate that the investment strategy is valid for the UK market, independently of the size of companies invested.

Table 7 shows a summary of the results for all the models previously regressed, estimated for the equally weighted portfolios, and based on monthly returns from April 2010 to March 2018.

	%	EWP		
		Buy	Sell	Buy-Sell
CAPM				
α		1,02**	-0,26	1,28***
β		0,81***	0,77***	0,04
FF3				
α		0,84***	-0,42	1,26***
β		0,85***	0,79***	0,06
SMB		0,77***	0,89***	-0,11
HML		0,11	0,28**	-0,17
FF3 + Momentum				
α		0,81***	-0,40	1,21***
β		0,86***	0,79***	0,07
SMB		0,78***	0,88***	-0,10
HML		0,13	0,27*	-0,13
WML		0,04	-0,02	0,06
FF5				
α		0,88***	-0,37	1,25***
β		0,85***	0,78***	0,07
SMB		0,76***	0,86***	-0,10
HML		0,06	0,20	-0,14
RMW		-0,09	-0,15	0,05
CMA		0,03	0,05	-0,02
FF5 + Momentum				
α		0,85***	-0,36	1,21***
β		0,85***	0,78***	0,07
SMB		0,75***	0,86***	-0,10
HML		0,08	0,20	-0,11
RMW		-0,13	-0,14	0,01
CMA		0,00	0,06	-0,06
WML		0,05	-0,01	0,06

Table 8: Regressions analysis for small-cap companies.

Notes: *** represents p-values <0.01, ** represents p-values <0.05, and * represents p-values <0.10

Chapter 5

Conclusion

The comprehensive analysis conducted in this dissertation delves into the impact of narrative tone in annual reports on investors' decisions, employing a meticulous approach encompassing the construction of two portfolios—equally weighted (EWP) and value-weighted (VWP)—and a thorough examination of various regression models, including CAPM, FF3, FF3 + Momentum, FF5, and FF5 + Momentum. By scrutinizing stock returns based on the net tone change of annual reports from 2010 to 2018, this study offers insights into the intricate dynamics at play in investment strategies guided by the annual report net tone change of FTSE350 companies.

Throughout the investigation, it became evident that the net tone change of annual reports plays a pivotal role in shaping investment outcomes. Notably, the strategy of buying stocks with positive net tone variations while selling negative ones consistently outperforms the market, as evidenced by both the EWP and VWP generating higher Sharpe ratios compared to the FTSE350. This highlights the significance of incorporating annual report tone into investors' decision-making processes and forecasting the future performance of companies.

Moreover, the analysis of regression results across different models reveals intriguing findings regarding the relationship between annual report tone and portfolio performance. While CAPM regressions yield limited insights due to

model constraints, subsequent models such as FF3, FF5, and their momentum-augmented counterparts offer more perspectives.

The most exciting result of this model lies with the positive and significant alphas in both portfolios ranging from 0,74% to 0,88% for the EWP from 0,49% to 0,68% for the VWP. This indicates the efficacy of the strategy in generating market-beating returns, particularly in the EWP. The models are not able to completely explain the behaviour of stocks taken into consideration. However, it is possible to outline that the strategy has an implicit bet on bigger companies and companies that perform better historically which suggests that investment decisions can be guided by annual report tone changes.

Furthermore, the differential impact of portfolio weighting methodologies—equally weighted versus value weighted—emerges as a key consideration. While the EWP demonstrates superior performance over the analysed period, owing to its broader diversification and reduced reliance on market capitalization, the VWP underscores the market's valuation of individual companies, potentially leading to a concentration in larger firms. This highlights the importance of aligning portfolio construction with investment goals, risk tolerance, and prevailing market conditions.

However, it is important to consider the limitations of this study. Firstly, it focuses on specific stock markets. Although we have extended the study to small-cap stocks, the results might not be the same in other geographical markets. The analysis excludes other factors that could influence stock performance, such as financial health or economic conditions, and assumes that investors always make rational decisions. Regarding methodology matters, a lot of companies were excluded due to limitations of net tone information. Furthermore, the choice of rebalancing the portfolios in April may exclude the contributions regarding companies that release their reports in other months.

In conclusion, this dissertation provides compelling evidence supporting the significance of narrative tone in annual reports as a determinant of investors' decisions and subsequent portfolio performance. By leveraging sentiment analysis, investors can identify companies poised for growth and mitigate risks associated with negative sentiment. The findings underscore the relevance of incorporating qualitative insights into quantitative investment strategies, paving the way for more informed decision-making and enhanced portfolio outcomes in dynamic financial markets.

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