Who Felt Cheated? Analyst Graphic Distortion and Punishment by Investors.

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Abstract

The literature about sell-side analysts (analysts) is broad. Nonetheless, little research has been done regarding how these sophisticated users of financial information (Schipper, 1991) disclose current and target price in form of graph. More precisely, we try to investigate if analysts are prone to distort the graph information and what would be the likelihood to continue to follow the ‘noisy analyst’ by non-professional investors. We also try to measure what would be the likelihood to continue to invest in the security. We apply Tuffle (1992) Graph Distortion Index (GDI) and notice that analysts are prone to distort graphs. We also apply laboratory experiment to measure the likelihood of non-professional investors to continue to follow the analysts and to continue to invest in the security. We find that investors ‘punish’ the noisy analyst by reducing the likelihood to follow him/her. The non-professional investors also reduce the likelihood to continue to invest in the firm, even if the data provided in terms of numbers are correct. These findings shed new light in the financial literature and by confirm that ‘normal people’ tend to trust by reflexiveness, and are prone to cognitive errors (Statman, 2014).

Keywords: sell-side analysts, non-professional investor, trust and punishment, analyst’s report.

Método de Pesquisa: MET4 – Experimental/Quase-Experimental;

Área do Conhecimento da Pesquisa: AT 4 - Contabilidade e Finanças;
1. Introduction

The use of visual aids, such as charts and photographs, in order to transmit a message has been widely exploited by companies in their annual reports (Beattie & Jones, 2008; Davison, 2014). In theory, the main motivator for the use of visual aids would be to enhance our understanding about disclosed numbers. Nevertheless, there are studies arguing that companies make use of visual aids as a way of shaping our impressions, in other words, graphics has been used to change our perception of numbers/texts (Baldvinsdottir et al., 2009). By doing that, managers would be using the visual aids for their own benefit. That is, misusing the real purpose of the graphics usage. In this context, one may question if investors can assess rationally investment decision and, by assuming that, managers may be misleading general investors in some important piece of information, which is the visual aids. At this point, is possible to infer that the debate of visual aids in the annual reports may be richer. However, there is little evidence about sell-side analyst’s reports. Also, it is important to understand how non-professional investors will react when they feel misled, do they continue to follow the ‘cheater sell-side analyst’? What would be the implications into security market?

Sell-side analysts (hereafter, analysts) are known as important intermediaries of financial information (Schipper, 1991) and multiple investors, institutional and non-professionals, follow their reports (Brown, 1993). Jackson (2005) claims that the analyst faces a conflict between telling the truth to build his/her reputation versus misleading investors via optimistic forecasts to generate short-term increases in trading commissions. Therefore, it is possible to infer that analysts also may misuse visual aids to that purpose. In this paper, we expect to accomplish two major objectives: i. Are analysts prone to misuse the real purpose of visual aids, that is, to ‘cheat’ non-professional investor by distorting the graphic information? ii. What are the reactions of non-professional investors when they felt misled?

Guided by prior research in accounting and psychology (Beattie & Jones, 2008; Rousseau et al., 1998), we predict that non-professional investors, when notice that the analyst is misleading their investment decision by manipulation the visual aids, will ‘punish’ the noisy analyst by reducing the likelihood of following him/her. We also predict that the investor may change their likelihood of investment decision if notice that the analyst ‘break his trust’. Prior research in accounting provides evidence that investors follow analysts’ reports (Schipper, 1991; Clement & Tse, 2005). Prior research in psychology indicates that people, in general, when felt cheated tend to exclude the individual (Nietzsche, 1954). We argue that non-professional investors when felt misled (as a surrogate for cheated) tend to reduce the likelihood (or not follow at all) the noisy analyst, and they may even adjust their investment decision to ‘punish’ the noisy analyst.

A standard definition of ‘punishment’ does not exist in the literature. We define punishment applying the following constructs: (i) the downgrading of prior investment decision; (ii) reducing the likelihood of following the analyst; and (iii) a combination of all. Therefore, we

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1 Tversky (1974) had shown that people expend the double of the time analysing graphs than written information. Therefore, graphs may be considered an important piece of information to investors.
expect that investors revaluate their investment decision when they felt misled. We also expect that investors tend to stop to follow an analyst. We test these predictions by applying experimental methods. Specifically, we design this experiment based on reflexiveness concept. Thus, we assumed that people do trust based on someone’s else opinion or reputation. After that we showed a graphic demonstrating the current and target prices to two different groups of non-professional investors. Firstly, we provided to both groups the same Key Financial Variables (KFV) background. Then, for the first group (Group A - treatment), we showed a graphic out scale related to historical current and target price. For the second group (Group B - control), we showed the graphic in scale. Finally, we asked to the participants if they would reassess their likelihood to following some analysts and their investment decision using a scale of 1 (not follow/change) to 11 (follow/not changing). In the end of the experiment section, we let the subject know that the graph was (could be) out scale and what was their likelihood of (i) to continue to invest in the security; (ii) continue to follow the analyst; and (iii) if the subject would recommend the analyst to another person.

Investigating how non-professional investors react when felt misled is important for several reasons. First, previous focus group research had shown that institutional investors rely more in visual aids, such as graphs and charts, than ‘eye-catching’ information (Securities, 2013). If institutional investors, which are known as sophisticated users of financial information and analysts’ report (Schipper, 1991) rely more in the graphic content of analysts’ report, it is possible to infer that non-professional investors would rely heavily in visual aids. This finding also was confirmed by behaviour research. Tversky (1974) demonstrated that humans devote twice as much time analysing graphics than numbers and text. Therefore, a correct use of visual aids would reduce the cost of information. Second, non-professional investors are amongst the highest investors in the capital market, with approximately US$ 8.5 billion dollars invested in 2010 (Securities, 2013). Finally, measure how ‘normal-people’ (Statman, 2014) behaves in terms of investment decision is a question of interest of the literature in general.

Consistent with our expectations, we find that investors change their investment decision by downgrading the likelihood to invest in security as well as the likelihood to continue to follow an analyst. The ‘punishment’ appears to be more prominent for the group that was ‘cheat’ (Group A) than to group that was inform that the graph was in scale and what would be their reaction if the graph depicted was out of scale (Group B), albeit it seems that the subjects do not stop to following him/her entirely. The same situation is not observed in laboratory experiments of punishment (Solomon, 1964). These findings demonstrated a certain level of relaxation of the general rule that when felt cheated a person stop to have relations with the cheater (Nietzsche, 1954). We notice that the firm is also punished, although with less severance. This finding indicate that people rely more heavily in the graphs than financials and texts, even when the KFVs provided are correct and available. These results shed new light in the economics literature that claims that people “choose trust when its expected value is greater than the status quo payoff” (Evans & Krueger, 2011).

Our study contributes to prior research in accounting and behavioural finance in several aspects. First, we expect to show that graphs might influence investors’ decision and may be an indication that graphs should be included as subject of review or audited by regulators, brokerage firms or investment banks. Secondly, as more evidence about graphs in companies’
reports is available, we contribute in the setting of analysts’ graphs. Finally, we find evidence consistent with investors not only punishing the analyst due graph misuse, but also that they would change their likelihood of investment decision on company’s stock. The remainder of the paper is organized as follows. In section 2 we present the theoretical background and hypothesis. In section 3, we argue about the usage of visual aids and the Graphic Distortion Index. In section 4 we present the methodology applied in this study and the results. Finally, in section 5 we addressed the conclusion and limitations.

2. Theoretical Background and Hypothesis Development

2.1. Trust

One of the challenges of studying trust (or breach of trust) is the clear lack of standard definition of this construct amongst researchers. Some authors claim that trust may be related to “disposition, decision, behaviour, social net-works and institution” (Rousseau et al., 1998). Others assume trust as a by-product from the relation of authentic leadership and organizational deviance (Erkutlu & Chafra, 2013). Solomon and Flores (2001) argued that trust starts in the childhood and the bleach of trust may cause consequences in which the person will carry on for the rest of his adult life. This gap is more prominent when we try to understand how trust is constructed between non-professional investors and analysts and the consequences of breach of trust (punishment). Perhaps the term “willingness to rely on another under conditions of risk and interdependence, still expecting positive outcomes” (Bhattacharya, Devinney, & Pillutla, 1998) may be suitable to describe this type of relationship but still is incomplete. Rousseau et al (1998) gave a step forward to define broadly trust in a multidisciplinary view. Rousseau et al (1998, p. 395), after a careful content analysis, came with a broadly definition of trust: “Trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions of behaviour of another” (Rousseau et al., 1998, p. 395). This broad definition of trust seems to fit better to our research. That is because non-professional investors often have no direct contact to analysts, they rely in the analysts’ final product, the recommendation report. Therefore, we may infer that non-professional investors recognize their vulnerability due to information asymmetry. Consequently, they rely in the analyst opinions and recommendations (Clement & Tse, 2005).

Trust may be built based on one reputation or certification (Rousseau et al., 1998). That is because non-professional investors follow the ‘best’ analysts’ opinion (Barron, Stanford, & Yu, 2009). Barron, Stanford, & Yu (2009) comment that investors rely on well-known investment magazines, such as Institutional Investor Survey (II) All America First Team for USA, or the Financial Times Extel Survey (FTE) for the UK, to identify such professionals. It may be logical to infer that once the trust is broken the investor may felt misled and change their willingness to continue to follow the noisy analyst, and perhaps his investment recommendation. Briefly, trust between non-professional investors and analysts may be defined as an internal decision

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2 The use of computer systems and the internet has influenced how investors trade on the stock exchange. Investors who trade online have access to a huge range of information, which can enhance the overconfidence, because it provides the illusion of knowledge and control, while changing the decision criteria (Barber & Odean, 2001). Barber & Odean (2001) notice that non-professional investors tend to move from telephone to online stock trading.
process based on the probability of taking risk by assuming a high (and perhaps not perceived) interdependence amongst one party (investors) to another (analysts). In other words, investors highly relying on analyst’s opinion. This inference supports Statman (2014) statement regarding normal investors, unlike rational investors, are prone to develop cognitive errors, specially hindsight and overconfidence.

2.2. Building trust

As mentioned in the previous section, there is little evidence in the literature demonstrating how trust between non-professional investor and analysts is built. How to build trust is hard to be broadly define. Trust is normally associated to risk of uncertainty and uncontrollability of some future event or other people behaviour in the social world. Sztompka (2003, pp. 20-21) defined trust as an end-product of the prediction and control process and may be applied to demonstrate degree of certainty about events or people behaviour (I trust that my friend is coming to dinner with me). Sztompka (2003) also defend the idea that under prediction and control trust is not necessary. Therefore, the author divided the world in two central elements, the natural world and social world.

In the natural world events happen with some high degree of prediction (the sun will rise in the morning). In the social world the idea of trust assumes two basic characteristics, one characteristic is the borderline of trust where people rely in quasi-human agents (I trust that God will help me, I trust my car will run in the morning), and the other is the social interactions as itself where “often our expectations are weak, as we lack the possibility of precise and accurate prediction of other people's actions” (Sztompka, 2003, p. 22). The focus of this study relies on the second element, more precisely, people relying in someone’s else opinion to follow an analyst and make investment decision.

Analysts are known as professional users of financial information (Schipper, 1991) and their recommendations are follow closely by investors (Brown et al., 2015). What drives an analyst to recommend one security is still subject of debate in the finance literature (see some examples in Barber, Lehavy, & Trueman 2001 and Barron, Stanford, & Yu, 20093). Even so is well known that several investors (institutional and non-professional) follow their reports and recommendation (Barber, Lehavy, & Trueman, 2001). Therefore, one possible outcome is that non-professional investors rely in their opinion based on reflexiveness. That is, non-professional investors rely on analysts’ opinion to make investment decision based on analyst’s experience, their internal beliefs or someone’s else opinion (Sztompka, 2003).

There is no consensus in the literature if people should follow analyst recommendation. On one hand, some authors question if analysts add value into security market. This stream of literature criticizes the possible dual role that analysts may play in the security price formation process, that is, analysts tend to have unrealistic optimism and over recommend glamour stock (Jegadeesh et al., 2004). This may lead us to question if is not dangerous follow their recommendations. On the other hand, some authors argued that following analysts’

3 Is widely documented that analysts may be driven by economics reasons (commissions and fees), reputation or pressure for employers (brokerage firms) (see BROWN et al., 2015)
recommendation may be profitable if investor does not trade too much and follow renowned analysts, that is, analysts with good reputation on the market security (Barber et al., 2001; Barber, Lehavy, & Trueman 2007). In fact, reputation seems to be one key element to build analyst trust.

Reputation has been noticed as one consensus in the financial literature. Basically, previous studies demonstrated that investors (professional and non-professional) tend to follow (as surrogate for trust) renowned analysts (Mokoteli, Taffler, & Ryan, 2006; Barber, Lehavy, & Trueman, 2007; Mayew, 2008). Therefore, the trust of analyst’s recommendation arises based on someone’s else opinion, or by reflexiveness. There is evidence that analyst better ranked in well-known financial magazine or newspaper, such as the First Team of Institutional Investor (II) magazine for USA or Financial Times Exeter Survey for UK, are closely followed by investors and their reports have some impact into security market, in other words, investors trade more based on well ranked analysts (Huang, Zang, & Zheng, 2010; 2014). Therefore, it seems that some authors agree that trust arises when risk is perceived and some background of the person/situation is known (Blomqvist, 1997). This situation it may be noticed in the security market where non-professional investors rely on analyst’s report (Clement & Tse, 2005). Blomqvist (1997) argued that when information asymmetries increase, trust seems to decrease. Therefore, “in total ignorance it is possible only to have faith and/or gamble” (Blomqvist, 1997, p. 272). Nonetheless, if information asymmetric is low people behave in rational way and trust is no longer needed (Blomqvist, 1997; Sztompka, 2003). Thus, trust can be understood as part of arbitrage process and irrational behaviour from non-professional investor, and, in fact, ‘normal-people’ tend to make investment decision in irrational way (Statman, 2014).

If we assume that these arguments are correct, the decision of trust may be considered as bounded rationality, in order words, the decision of trust is take in a flexible manner (Evans & Krueger, 2011). Evans and Kruger (2011, p. 174) applied laboratory experiment to test the person's willingness to trust on other people judgment whether the risk of trust is worthy. That is, people measure the risk of trust against the temptation to betrayal. The authors demonstrate that when the risk is high (low) people make decision rapidly (slowly) and tend to not trust (do trust) on another player. The authors conclusions demonstrated that people’s trust assume different levels depending of the payoff and their own perspective of risk. That is, “people reduce the complexity of trust by approaching the decision from an egocentric perspective” (Evans & Krueger, 2011, p. 175). The author findings suggest that people are willing to trust when both consequences and risks are well known, otherwise they would distrust more often.

Evans & Krueger (2001) paper may have some practical application, such as internet commerce, here buyer and seller have no direct (or minimum) interactions and the willingness to purchase an item in some webstore is often due to other factors beyond price may be the trigger to trade. Thus, the buyer experience is a combination of trust of different elements (in this regard the seller reputation, warrantee provided, tracking tools) rather than price. This is commonly named in psychologic literature as trust by reflexiveness. This concept, ceteris
paribus, may be applied to help to understand in which level non-professional investors trust analyst’s graphics depicted and report recommendation. The discussion of how trust between non-professional investors and analysts may be built seems somehow easier to infer, while consequences of decline of trust remains as an incognita. We expect to discuss this matter in the next section.

2.3. Decline of trust

There is no consensus about when and in what extent the decline of trust may occur. Decline of trust may emerge when the perception of transparency, integrity or honesty about some people (the trusted) is doubtful (Bhati, 2015). Those elements are constantly named as trusting’s expectations (Dibben, 2000). Dibben (2000, p. 60) argues that the process of the decline of trust is similar of building trust, the only exception is the new information that bleach or foggy one’s previous expectation (the trusting). Trust based on reflexiveness usually is declined when the trusted part behaves in a way that the trusting part had not anticipated or realized too late. Once the new information arises, trust form the trusting part starts to be declined by reassessing the relationship with the trusted. This process can be breakdown from higher forms of trust until complete distrust (Dibben, 2000).

As mentioned before, the literature about trust and the decline of trust is richer when review agents and employees (Erkutlu & Chafra, 2013), bank institutions (Bhati, 2015) or ecommerce (Salam et al., 2005). There is little evidence about non-professional investors and analysts. Deutsch (1962) argued that trust arises when individuals are confidence in the intentions and capabilities of a relationship partner and the belief that a relationship partner would behave as one’s hoped. Therefore, decline of trust emerges when the same partner develops an undesirable behaviour, stemming from previous knowledge or capabilities (Deutsch, 1962; Lewicki, McAllister, & Bies, 1998). We believe that this broad concept may be a possible fit to understand how trust is built and declined between non-professional investors and analysts, based on the framework of effective collaboration.

2.4. Punishing the noise analyst

Punishing mislead analyst is as hard to define as distrust. In the social relations, the punishment for misbehaviour or malfeasance need not to be rendered by a court or the injured party. The part who violates the social norm might suffer social sanctions. In fact, some authors suggest that “high-status deviant is more easily able to elude sanctions than are his/her lower-status counterparts” (Giordano, 1983, p. 329). That is because their acts tend to seem normative and more acceptable, which can affect the severity of potential sanctions. While they can keep their manipulations less explicit, sell side analysts belong to higher-status agents towards their clients, maintaining their reputation and influencing the security market.

Still, it is also observable that peer punishment is relatively rare in real life. In contrast to experiments under anonymity, it can be costly. Sigmund (2007) argued that in small-scale societies and village life, or in the finance community, reputation might have a more pervasive

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See Lewicki, McAllister, & Bies, 1998 for a review of lack of consensus.
role. In that case, it is easier to denigrate someone’s reputation than simply stop following him. Undermining a good reputation is an inexpensive but ominous form of sanctioning, which may Eventually lead to the exclusion from the market for trustworthy partners. In this study, we argued that the one of the ways to non-professional investors to punish noisy analysts is to reduce their likelihood to follow this analyst. We also try to evaluate the likelihood of the same non-professional analyst will change his/her security investment decision.

3. The use of visual aids

The use of visual aids in annual reports is subject of few academic studies. Some of these studies are based on single-country sample (Steinbart, 1989; Beattie and Jones 1992) and other use cross-country samples (Beattie & Jones, 1996; 1997). The key findings of these studies are briefly demonstrated as following.

In the single-country sample, Steinbart (1989) analyses the annual reports of 319 Fortune 500 companies for 1986. The author shows that 79 percent of the Fortune 500 companies use graphs, with prevalence of sales, net income, and dividends as KFV graphed. Steinbart (1989) also demonstrated that the use of at least one of these variables and a positive change in net income are statistically significantly related. Beattie and Jones (1992) analyse the annual reports of 240 large listed UK companies for 1989. The authors also find that 79 percent of companies use graphs. Nevertheless, sales, income, earnings per share (EPS), and dividends per share (DPS) are the four most KFV graphed (31 percent of all sample of graphs). The authors findings subject that, in terms of selectivity, there is a statistically significant between depicted graphs of these four KFV and measures of corporate performance (Beattie & Jones, 1997). The two performance measures used were EPS and the specific KFV, measured as the increase/decrease in the current year and the upward/downward trend over five years.

In the cross-country sample, Beattie and Jones (1996) analyse the annual reports of 50 top domestically listed only companies in each of six countries for 1991–92. Six variables were graphed by over 25 percent of companies in one or more of these countries: sales, income, EPS, DPS, cash flow, and return on capital employed. In addition, graph usage was found to depend on performance, particularly in Australia, the United States, and the United Kingdom. In the second study, Beattie and Jones (1997) analyse the annual reports of 176 leading U.S. and UK companies for 1990, finding that 92 percent of U.S. companies use graphs compared with 80 percent of UK companies. Key financial variables are used selectively in both countries.

Beattie and Jones (1992) comment that little research try to understand how companies may misuse visual aids in their annual report (Beattie & Jones, 1992). Prior research had shown that shareholders rely in annual reports but usually do not read it thoroughly (Lee & Tweedie, 1975). In fact, this concept is not new and it has already been tested by Tversky (1974). In her study, Tversky (1974) made an experiment where a set of pictures and texts were demonstrated to randomly selected subjects and measure the percentage of memorization and eye fixation of which subject. The author’s findings demonstrated that the people, in general, devote twice of their time examining pictures than words (Tversky, 1974, p. 276). Thus, Beattie and Jones (1992) argued that the use of appealing visual aids would help companies to highlight and
clarify significant trends in the data. However, improperly constructed graphs can distort the trends and mislead the reader (Steinbart, 1989).

Although authors may have their own preferences in how to measure graphs errors (see Mather, Mather, & Ramsay, 2005; Beattie and Jones, 2008), they share the same idea that graphs are supposed to be accurate by assessing the following criteria: 1. Numerical values presented in graphs should match those in the financial statements. 2. The portrayed magnitude of change should match the numerical magnitude of change. 3. Formatting choices should not obscure changes in the data. Thus, not following these basics rules the graph may have bias and may mislead the reader’s perceptions. Mather, Mather, & Ramsay (2005, p. 148) argue that the most common form to misled our perception is doing measurement distortion. In general, graphs and charts displayed in annual reports are supposed to attend two specifics goals: (i) to help reader to analyse the Key Financial Variables (KFV) and (ii) to present or communicate information to readers (Beattie & Jones, 1992, p. 292). Nevertheless, measurement distortion occurs when managers changed the sizes of symbols, making it out of proportion to the numerical representation (Mather, Mather, & Ramsay, 2005). To help researchers and readers to evaluate the graph accuracy Tufte (1983) developed the ‘lie factor’, which was adapted to financial literature by Steinbart (1989).

3.1. Tufte lie factor and measure of graph distortion

Tufte (1983) demonstrate a way to ‘measure’ the distortion in graphs by introduction what the author called as ‘lie factor’. The ‘lie factor’ measures how much in percentage the pictured graph is out related to the nominal data. As consequence, “lie factors greater than 1.05 or less than .95 indicate substantial distortion, far beyond minor inaccuracies in plotting” (Tufte, 1983, p. 57). Steinbart (1989), when arguing the role of auditors as responsible to review the graphs accuracy in companies’ annual reports, used the theoretical foundations of the Tufte’s lie factor to introduce the ‘Graph Distortion Index’ (GDI). Steinbart (1989) based his study on 319 annual reports for 1986 from Fortune 500 and demonstrated that 79% include graphs from KFV. The total number of graphs from this sample was 698 with an average of graph discrepancies of 11%. The author findings raised concerns because most of the companies that tried to mislead reader was those with decline in net income. Thus, Steinbart (1989) suggested the GDI as a way to help reader to mitigate this possible misleading manager behaviour.

The GDI is commonly used in the academic literature because is simple to apply and its formula helps to quantify the level of graph distortion. The GDI measures the first principle of graphic accuracy that Tufte (1983) named as ‘graphical integrity’, in other words, in what extent the surface of graphics is out of proportion from the numeric quantities representation (Tufte, 1983, p. 77). Its formula is showing as following:

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GDI = \left( \frac{a}{b} - 1 \right)
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Where:
\( a = \) percentage change depicted in graph
\( b = \) percentage change in data
In theory, the GDI is a percentage that may range from -100% to +∞ (Mather, Mather, & Ramsay, 2005, p. 148) where the amount of -100% would be a complete graphic reversed plotted compared from the nominal numeric representation. The range of -5% to 5% would represent that the graph is fairly plotted\(^6\) and anything above (under) 5% demonstrate that the graph has been improperly plotted (Tufte, 1983; Mather, Mather, & Ramsay, 2005).

Companies, in general, include graphs of past performance and future trends of KFV, such as sales, net income, EPS and dividends. Beattie and Jones (2000) argue that the graphics on company annual reports are part of a carefully designed package, offering to the reader the possibility of ‘impression management’ (Beattie and Jones, 2000, p. 213). However, Beattie and Jones (1992, p. 293) argued that one of these goals has not been fulfilled due to lack of proper proportion between the scale of the graphs and their numeric representation. Measuring this distortion become subject of a new stream in the literature.

Beattie and Jones (1992) findings show that the use of graphic depends on corporate performance. Time series analysis has shown discretionary changes on the use of graphics, identified and related to changes in the corporate performance of companies over time. Based on annual reports of 137 best companies in the UK who were on active duty and reported continuously during the period 1988 to 1992, the authors demonstrated that the decision to use key financial variable (KFV) in the graphs is positively associated with measures corporate performance. This result is consistent with the hypothesis of manipulation - namely that the financial charts in company annual reports are used to manage favourable impression of the company's performance of the player and therefore to create a reporting bias. This scenario may not be different when we look at the analysts’ reports.

3.1.1. Analysts and Graphs

Analysts are known as important intermediaries of financial information (Schipper, 1991), and multiple users, professionals and non-professionals (Brown, 1993), closely monitor their reports. Analysts work with a short timeframe between receiving the information (financial and non-financial), to process it, to infer about economic scenarios and do forecasts to, finally, publish their recommendation; the use of visual aids, such as charts and graphs, allows the addition of a variety of information quickly and easily to the reader, helping to simplify complex information (Davison, 2014) and, consequently, reduce the cost of information processing by the reader.

The literature on company’s annual reports categorized three recurring problems in the graphics-based communication. That is, (i) selectivity (the manager chooses the information that he wants to support their recommendation); (ii) distortion measure (problem of scale) and; (iii) excessive enhancement (when one or more graphic components highlight some graphic facets). For example, use of inappropriate form of 3D graphics, inconsistent colours, including

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\(^6\) In fact, Mather \textit{et al.} (2005) argued that 0% is the right representation of graphic accuracy. However, since all studies that analyse graphs have their roots in the Tufte (1989) lie factor work, and in his book the author comment that a variation of ±5% is acceptable as minor plotting inaccuracy, we decide to adopt the range of -5% to +5% as fairly plotted, where 0% represents accurate graph plotting.
trend lines without the explanation giving the impression that certain data is explained with a better performance than the market in general, etc. (Beattie & Jones, 2008, p. 75). The three categories are observed in the analyst’s reports. How it is possible to note, the issue of graphic usage is more complex than it initially may seem. Due to lack of research in this area, this article is justified by our need to understand how analysts use visual aids to convey their messages. Few academic studies have investigated the practice of graphs usage (see Davison, 2014 Beattie and Jones, 1992). Still, none has investigated this issue using analysts’ reports. Graphics are unaudited and neither regulated and it may have a change to be used by analysts to confuse the reader. Therefore, greater analysis and understanding of how this feature is used by analysts is important for general users and regulators. Bearing this concern in mind is possible to raise the following research question:

RQ1 – Does analysts’ recommendation reports prone to be positively related to GDI when disclosure current and target price graph?
RQ2 – If analysts are prone to develop GDI, does investors ‘punish’ the noisy analyst reducing the likelihood to follow the analyst?

In the next section, we describe our methodology to answer those questions.

4. Methodology

4.1. Graphic Distortion Index

Following the studies of Tuffle (1983) and Beattie and Jones (1992) we measure in what extent the analysts are prone to distort (cheat) their graphs. In order to do this, we measure the percentage of change, in centimetres (cm), of the first depicted target price and the last target price plotted in the graph. After that we calculated the percentage of change in data of the same points. We decided to use the target price graph because is known that analysts support their recommendation based on their own valuations of stock and disclosed it via target price information (Bradshaw, 2002).

We analysed 279 reports from 3 different analysts during the years of 2012-2016. The analysts were chosen from the top American analysts (First Team) ranked by Institutional Investors (II). Per our analysis none report passed in the range defined by Tuffle (1983) of +/-5%. Tufte (1983) and Mather, Mather, & Ramsay (2005), argued that a range from -5% to 5% in GDI would represent a fairly depicted plotted graph. The author comments that any graphical distortion bigger than this range is not just a question of difference in printing (Tufte, 1983).

Figure 1 – Pareto’s histogram of GDI and change in target price disclosure as number.
In the Figure 1, based on Pareto’s graph, is possible to notice that the graphic distortion is more pronounced when the target price is depicted and less pronounced when target price is disclosed (Figure 2). In other words, analysts tend to adjust the graph target price according to how they want to enhance good news or soft bad news. This results are in accordance with studies of Beattie and Jones (1992). The authors notice that managers when doing annual reports tend to behave in the same manner.

Figure 2 - Pareto’s histogram of GDI and change in target price depicted in the target price graph

The results also support our RQ1 where analysts tend to distort graphic when they recommend to hold (0) and buy (1), and less distorted to sell (-1) recommendation (Figure 3). This finding also agree with several studies of analyst’s recommendation in which analysts tend to soft bad news and enhance good news (Bradshaw, 2002; Clement & Tse, 2005; Barber, Lehavy, & Trueman, 2007).

4.2. Experimental method.

4.2.1. Design.

Our experiment will allow us to test our predictions through a 2 X 2 full factorial and between-subjects design. The first independent factor in this study is the presence of graphs out of scale. We manipulate graphics using GDI theory. While our treatment group (Group B) will evaluate an analyst report with graphs out of scale, our control group (Group A) will assess these reports of same company but with graphs in scale. Also in two levels, in the second factor we manipulate the sort of analysts participants will follow, a top ranked analyst or an analyst indicated by some friend or relative. We follow the proposal of Rousseau et al (1998) about how built and wrecked the trust feeling. In other words, where trust deconstruction is a surrogate for cheated feeling. We therefore divided the experiment in three phases: (1) building of trust, that is, the trust is formed between investor and analysts; (2) stability, where the trust already
exists, and (3) the dissolution of trust, where the trust declines because investors felt mislead by the current analyst.

As pointed in the previous section, people used to trust based on reflexiveness, whether by an opinion of a closer person (such a family person or a close friend) whether by someone else ranking (such as a business magazine or newspaper). This, ceteris paribus, is a strong evidence of Rousseau (1998) definition of trust, in other words, people in general accept that people their vulnerability based upon positive expectations of the intentions of behaviour of another.

4.2.2. Participants.

The participants of our experiment were 30 students from two campuses of a Universidade de São Paulo, Brazil. As Libby, Bloomfield, and Nelson (2002) contend, the use of sophisticated participants is necessary just when the research question requires. The targeted participants are enrolled in accounting courses as senior graduation students. Those subjects are suitable to be considered as non-professional investors, since they have knowledge in finance and analysis.

4.2.3. Procedures.

In our experiment, participants were prompt to execute some tasks. We adopted a methodology with 4 envelopes, as proposed by Elliot et al. (2013). In Envelope 1, all participants will receive the same background information about the same company. This background information was composed of some Key Financials Variables (KFV) and the balance sheet (BS) and Profit & Loses (P&L) for the last five years. Besides, we let participants know they had received an unexpected amount of money, $30,000. Firstly, based only in the KPI and Financial Statements, we asked them, through an 11-point Likert scale, to specify how much was his/her attractiveness by investing on the company. Each participant randomly chose one group with no further information about the analyst, in other words, whether if the analyst is the one indicated by a person that the investor has confidence (Group A) or is higher ranked at Institutional Investor (Group B). In doing so, we can measure how they will move further from the wiliness to invest to the wiliness to punish the noisy analyst according to reflexiveness. Since the KPI was the same for both groups, we next show the graph of results altogether.

Figure 4 - Attractiveness to invest all groups

The axis X shows the likelihood to invest in the firm based exclusivity in the KFV. The axis Y shows percentage of respondents according to likelihood to invest.
The envelope 2 contains questions about the non-professional investor, such as age, gender and the highest degree that the student accomplished. Questions of this envelope were also applied to both groups. By gender, 59% were male and 41% were female. The distribution by group was: Group A: M-41%; F-14% and for group B: M-18%; F-27%. The average age for male was 23 years old and for female 20 years old.

We provided to all subjects envelopes with graphs demonstrating current and target prices out of scale (Group A), and another half contains graphs about same variables but in scale (Group B). As a random assignment procedure is used, participants chose what group (A or B) they belong already when they picked the first envelope and this choice continues during all experiment. We also provide the analyst’s recommendation for this hypothetical stock. In this study, we assume that the non-professional investor invest all the unexpected money ($30,000.00) in order to avoid variance of risk or riskless preference. Doing that way, we forced all subjects to take a risk position in order to properly measure how the shift in the preference of following an analyst will behave. In other words, we asked whether they would continue following that analyst (1-11 scale, in which 1 stands for not following anymore and 11 continue to follow). In the experiment, 80% of the subjects were first time investor and 20% already invest 1-5 times during the same time. In the same group, 14% already bought/sold securities and 86% intend to invest again in the next 10 years. From the total number of respondents, 50% would rely on an analyst recommendation to buy/sell securities and 30% would do their own research and analysis before invest.

Figure 6 - Graph Group A (out scale)

Figure 5 – Graph Group B (in scale)

In the envelope 3 we start the experiment showing a graph with closing price and indication of target price out of scale (Group A) and in scale (Group B). In this graph is possible to 7 periods, as is shown below.

We provided a set of 3 questions to see in what extent the investors are willing to invest in a security and to trust in the fictional analyst based on their reflexiveness (person that he/she trust or well ranked analyst). Provided for the fact that Group A received graph out of scale and Group B received graph in scale, the distribution is shown in the Figure 9 (left and right). The group B seems to be more willing to invest even with little information. The reason why this variance happens we were not able to verify in this study.

The second question of envelope 3 is intended to measure the likelihood to follow an analyst based on the target price graph. The boxplot graph (Figure 8 left) shows this likelihood. The third and last question of envelope 3 is related to willingness to recommend this analyst to other people (Figure 10 left). The results show us that, even with the same financial information background, people tend to rely on graphs to make investment decision. That is because the
group A received the financial information of the same firm and period depicted in the graph. The group B, although received a graph in scale, received a different firm graph.

Finally, in the envelope 4 we provided 12 questions to measure in what extent the non-professional investor relies on graphs to help his/her investment decision (measured by the likelihood of investment) and if the non-professional investor will ‘punish’ the noisy analyst when it was disclosed that the graph is (could be) out scale.

*Figure 7 – What information you may need to make the investment process smoother?*

With the question 1 of envelope 4 we tried to understand which information a non-professional investor may seek to make an investment decision smoother. In the Q1a we asked if the subject rely exclusively in financial statements. Zero participants rely exclusively in the financial statement. In the Q1b we asked if the subject rely exclusively in the current and target price graph. For the group A (graph out scale), almost 10% rely exclusively on this piece of information to make an investment decision. For the group B (graph in scale), this percentage increase to almost 15%. In Q1c we asked if subjects rely with both information, in other words, if the non-professional investors rely on the current and target price and with financial statements together. Nearly 27% of Group A rely in both piece of information (14% for Group B). Finally, in Q1c we asked if the subject need more information apart from financial statement and the graph of current and target price. For this question, 18% of respondents of both groups answered that they may need more information in order to make an investment decision.

In question 2 of envelope 4 we tried to measure in what extent the subjects rely on the graphs to invest their extra-money. For group A, 50% (70% for group B) rely on the graph with financial statement together. This finding does not support the arguments of Tversky (1974). The author contends that people in general devote twice time checking graphs than plain information. Nonetheless, we are not able to measure the time spent by subject between envelope 1 to 4. This is a limitation of this study and perhaps need to be better explored. The results by group and total are demonstrated below.

*Table 1 - Considering the analyst’s recommendation, what information do you need more?*

<table>
<thead>
<tr>
<th></th>
<th>Q2a</th>
<th>Q2b</th>
<th>Q2c</th>
<th>Q2d</th>
<th>Q2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0%</td>
<td>8%</td>
<td>50%</td>
<td>0%</td>
<td>42%</td>
</tr>
<tr>
<td>B</td>
<td>0%</td>
<td>0%</td>
<td>70%</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>A+B</td>
<td>0%</td>
<td>5%</td>
<td>58%</td>
<td>5%</td>
<td>32%</td>
</tr>
</tbody>
</table>
Legends:
E4Q2a – Financial Statement only
E4Q2b – The current and target price graph only
E4Q2c – Both current and target price graphs and financial statement.
E4Q2d – Only rely on analyst’s recommendation
E4Q2e – I would need more information apart from analyst’s recommendation and the financial statement and the graph of current and target.

With the third question of envelope 4 we tried to measure the extent that subjects trust in analyst’s graph disclosure. Most of subjects (77%) trust with restrictions and only 18% of all subjects fully trusted. This results supports the findings of Womack (1996) and Clement and Tse (2005) that investors in general adjust analyst’s disclosure and recommendation.

Q3  Level of confident that the graphs are depict correctly

<table>
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<th>A+B</th>
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</thead>
<tbody>
<tr>
<td>a I fully believed</td>
<td>17%</td>
<td>20%</td>
<td>18%</td>
</tr>
<tr>
<td>b I believe with restrictions</td>
<td>83%</td>
<td>70%</td>
<td>77%</td>
</tr>
<tr>
<td>c I don’t believe</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>d I don’t used to see graphs</td>
<td>0%</td>
<td>10%</td>
<td>5%</td>
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</table>

With fourth and fifth questions of envelope 4 we tried to measure the extent that the subject trust in someone whether by everyday social routine (Q4) whether to handle their finances (Q5). The results are demonstrated below. The results above confirm our prediction that people rely on reflexiveness whether for social relations or deal with their savings.

Q4 - Daily what has more importance to you to trust someone

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<th>A+B</th>
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</thead>
<tbody>
<tr>
<td>a A person on his/her word</td>
<td>0%</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>b A person reputation</td>
<td>67%</td>
<td>50%</td>
<td>59%</td>
</tr>
<tr>
<td>c I trust nobody</td>
<td>25%</td>
<td>0%</td>
<td>14%</td>
</tr>
<tr>
<td>d None of above</td>
<td>8%</td>
<td>40%</td>
<td>23%</td>
</tr>
</tbody>
</table>

Q5 - What about your savings?

<table>
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<th>A</th>
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<th>A+B</th>
</tr>
</thead>
<tbody>
<tr>
<td>a A person on his/her word</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>b A person reputation</td>
<td>42%</td>
<td>50%</td>
<td>45%</td>
</tr>
<tr>
<td>c I trust nobody</td>
<td>17%</td>
<td>30%</td>
<td>23%</td>
</tr>
<tr>
<td>d None of above</td>
<td>42%</td>
<td>20%</td>
<td>32%</td>
</tr>
</tbody>
</table>

In the sixth question of envelop 4 we tried to test in what extent the subjects examine a security recommendation report. In this question, we were aware of the possible limitation regarding what people say and what they really do (Tversky, 1974). Surprisingly, most subjects confirmed that they devote more time checking first graphs and latter read the report.

Q6 When you analyse an analyst's report, in your opinion, you devote more time doing:

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<th>B</th>
<th>A+B</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Reading the report as a whole</td>
<td>42%</td>
<td>30%</td>
<td>36%</td>
</tr>
<tr>
<td>b Checking all graphs first, reading the report latter</td>
<td>58%</td>
<td>50%</td>
<td>55%</td>
</tr>
<tr>
<td>c Only checking the graphs</td>
<td>0%</td>
<td>20%</td>
<td>9%</td>
</tr>
</tbody>
</table>
In questions 7 and 8 of envelop 4 we tried to investigate how important is the current and target price graphs to the subjects.

**Q7 - When you analyse a security, what is the role of current price graph for you?**

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<th>A</th>
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<th>A+B</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Very important</td>
<td>42%</td>
<td>60%</td>
<td>50%</td>
</tr>
<tr>
<td>b Moderate important</td>
<td>42%</td>
<td>40%</td>
<td>41%</td>
</tr>
<tr>
<td>c Not very important</td>
<td>8%</td>
<td>0%</td>
<td>5%</td>
</tr>
<tr>
<td>d Irrelevant</td>
<td>8%</td>
<td>0%</td>
<td>5%</td>
</tr>
</tbody>
</table>

**Q8 - What about target price graph?**

<table>
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<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>A+B</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Very important</td>
<td>8%</td>
<td>20%</td>
<td>14%</td>
</tr>
<tr>
<td>b Moderate important</td>
<td>50%</td>
<td>70%</td>
<td>59%</td>
</tr>
<tr>
<td>c Not very important</td>
<td>42%</td>
<td>0%</td>
<td>23%</td>
</tr>
<tr>
<td>d Irrelevant</td>
<td>0%</td>
<td>10%</td>
<td>5%</td>
</tr>
</tbody>
</table>

With questions 10 of envelop 4 we disclosed for group A that the graph is out of scale and asked them what is their likelihood to follow the ‘cheater’ analyst. For group B we disclosed that the graph is in scale but asked them what would be their likelihood to follow the same analyst if he/she had saw a graph out of scale. The results show us that people do punish the noisy analyst but do not tend to exclude completely. In this situation, in terms of trust, there is a ‘relaxation’ in behaviour. In other words, people tend to be more severe to punish someone that he/she know than a stranger.

**Figure 8 – Likelihood to follow an analyst before and after discovery the graph distortion**

In question 11 of envelop 4 we asked for both groups their likelihood to continue to invest in the firm once it was disclosed that the graph was (could be) depicted out of scale. The results show us that people also punish the firm. This is an important finding and support our prediction that people, once felt misled, punish the noisy analyst and the firm. This evidence shed new light in the literature and support the assumptions that people try to behave rationally but act irrationally.

**Figure 9 – Likelihood to invest in the security before and after discovery the graph distortion**
In the final question (Q12) of envelop 4 we tried to measure in what extent the subject was willing to recommend the (possible) noisy analyst. For the group A the ‘punishment’ was more prominent. For the group B the ‘punishment’ was soft due to the fact these subject was dealing with a supposing cheater. It is clear that who felt ‘cheated’ seek for ‘revenge’ or ‘retaliation’ with more intensity than others.

5. Conclusion and Limitations

In this study, we intended to achieve two major goals. The first was to verify if analysts are prone to ‘cheat’ non-professional investors by distorting their graph information. To measure that, we use Tuffle (1983) Graph Distortion Index (GDI). We collected 279 analyst’s report during the years of 2012-2016, measured the variance between the initial target price and final target in centimetres, and compared with the variation in currency. None analyst passed in the test, admitting an error range of + - 5\%. This shed new light in the analyst’s literature and perhaps open a new debate of how analysts ought to communicate to the general public their analysis.

After that, we tried to measure how would be the reaction of security market, specially non-professional investors, when they realize that they had been ‘cheated’. We decided to apply experimental methods to try to measure this question. According to our findings, people trust based on reflexiveness and, once they notice that they had been ‘cheated’, they punish the noisy analyst by reducing the likelihood to continue to follow him/her. They also punish the company, by downgrading the likelihood to invest in the firm. By group, the punishment for both seems to be severer for the group that received the graphs out of scale than for the group that was asked how they would evaluate if graphs were out of scale. Although this is an important finding, it seems that people, in general, are more willing to punish a person that they know than a person that they don’t know. This indicated a ‘relaxation’, in which Nietzsche (1954) theory argues that people when felt cheated tend to exclude the person on their lives and support Statman (2014) arguments that ‘normal-people’ are boundary rationally.

Although our findings shed new light in the already wide analyst literature, there is some limitations, as with any new measure. One of the limitations is not to include other majors of graduation apart from accounting and finance. This would give us a broader view in terms of people with no single experience in finance. We recommend further research to refine construct validity, as scale development in an iterative process. Although two samples were used here, it
is possible that some aspects of the samples or choices of outcome variables could have biased the results

6. Bibliography


