The Impact of The Anchoring and Adjustment Bias on Analysts' Forecast in Vietnam Stock Market

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Abstract

In this research, we consider a well-known behavioral bias of financial market participants, the anchoring and adjustment bias described by Tversky and Kahneman (1974). Empirical findings have shown that this heuristic has significant economic consequences for the efficiency of the financial market of Vietnam. Specifically, we investigate the existence of anchoring and adjustment bias when stock analysts forecast future earnings of a firm by examining 661 analysts' reports forecasting prices in Vietnam from 2009 - 2012. In addition, we find that anchoring and adjustment bias appears to have considerable influence over both male and female analysts. With the multi-variable regression model, we find out the effects of anchoring and adjustment bias on different group of analysts as well as the time horizon.

Keywords: Anchoring and adjustment bias, analysts' earnings forecasts, forecasting error, behavioral finance.

1. Introduction

Stock analysts are undeniably an essential part of stock markets today. They carry out research on publicly traded companies and make recommendations on the stock price of those companies. As the most specialized in a particular industry or sector of the economy, they exert considerable influence in today's marketplace. Analysts' recommendations or reports can influence the price of a company's stock - especially when the recommendations are widely distributed through television appearances or through other electronic and print media. The analysts' recommendations are supposed to help investors make informed decisions. As a general rule, investors consider analyst's recommendations as one of the essential factors when deciding whether to buy, hold, or sell a stock. Therefore, stock analysts' recommendations receive a lot of attention and have significant impact on every participant in the financial market. In the theory of standard finance, stock analysts should be "rational", logical persons and not affected by any subjective or objective reasons. However, we cannot deny the effects of psychology factors on people and analysts are not an exception. Thus, not surprisingly, the activities of stock analysts have been a fertile ground for behavior research. Prior studies have shown that analysts often suffer from a number of biases such as herding behavior, overconfidence, and so on. However, in our research we consider the behavior of financial market participants from a difference perspective by focusing on anchoring and adjustment bias.

The anchoring and adjustment heuristic was first theorized by Amos Tversky and Daniel Kahneman (1974). Along with two more well-known heuristics (representativeness and availability), people are assumed to use this heuristic in the process of making decisions under conditions of uncertainty. Tversky and Kahneman define anchoring as a phenomenon when people make estimates by starting from an initial value or reference point, or arbitrary price levels. The initial value or starting point may be established from the formulation of the problem, or it may be the result of a partial computation. However, the adjustments are typically insufficient. That is, different starting points yield different estimates, which are biased towards the initial values. The anchoring and adjustment bias is proven by numerous studies in the world to be one of the strongest biases affecting people when making decisions. Many of the researches conducted relate to behavioral science and have a wide application in other fields. Particularly, Richard Block and David Harper (1991) in their study "Overconfidence in estimation: Testing the anchoring and adjustment hypothesis" provides the first test of anchoring and adjustment explanation for another bias, that is, overconfidence. In addition, Nicholas Epley and Thomas Gilovich (2006) designed five different experiments to explain why the use of the anchoring-and-adjustment heuristic yields reliable anchoring effects-that is, why adjustments tend to be insufficient. In the field of economics, we also find various studies that use the regression model to show the existence of forecast errors cause by anchoring bias; such as the study of Campbell and Sharpe (2007), Ichiue and Yuyama (2009, JMBC), Tz-Pu, Chang (2012). There are also a considerable number of researches on the anchoring bias in the real estate field. Northcraft and Neale (1987) suggest that real-estate pricing decisions depended on the listing price for the property, which serve as an anchor value. Later on, by using a hedonic model with a unique dataset, which includes the completion of all transactions in the Taiwan real estate market, Chang, Yeh and Chao (2012) provide evidence of the role of anchoring bias in the Taiwan real estate market.

Recently in Vietnam, there have been some published studies on behavioral bias in asset pricing practice. Moreover, the majority of these researches take investors as the subjects of the study while analysts are somewhat ignored in this field of research. Meanwhile, stock analysts play a vital role in the stock market – giving guidelines and recommendations for investors. To cover the gap in the literature, this paper examines the relationship between the anchoring and adjustment bias and analysts' forecast values. By using regression analysis and hypothesis testing, we attempt to find out whether stock analysts are truly "rational" and specifically, we want the answers for the questions: *"Do analysts in Vietnam anchor when making pricing decision?"* and *"What is the effect of anchoring and adjustment bias on the forecasts of analysts?"* Our findings in this research has provided concrete proof that anchoring and adjustment bias is one of the factors contributing to the forecasting error and affecting the quality of analysts' evaluations in Vietnam. Besides, other issues related to the behavioral bias and forecasting practice are also explored in this research. Some of them are to identify the effect of anchoring and adjustment bias on different group of analysts as well as the time horizon and to find out supplementary contributors to forecasting errors.

2. Theoretical framework and literature review

2.1. Theoretical framework

Reasoning and models used in the research are built upon the basis of two main theories: the efficient market hypothesis assumptions, and the behavioral finance theory.

2.1.1. The efficient market hypothesis

Initiated by Bachelier (1900) and Kendall (1953) and developed by Eugene Fama in the 1960s, the efficient market hypothesis states that in an efficient market, prices fully reflect all available information and the change in the price of securities follows a random walk as unexpected information appears.

According to the efficient market hypothesis, there are three forms of market efficiency. These are strong form, semi-strong form and weak form. The weak form of efficiency of the market indicates that all past information is incorporated in the stock price. As a result, one cannot beat the market using technical analysis of historical price movements. As for the semi-strong form of efficiency of the market, stock prices present all the past and the current publicly available information such as financial statements, management quality, and product line. Therefore, no abnormal return can be gained using technical and fundamental analysis. However, insider traders can still beat the market. Finally, in the strong form of efficiency, all information including past, publicly available and private information, is reflected in the stock price. This form of efficiency implies that even inside traders cannot make more than the market.

One significant feature of the efficient market hypothesis is that all forms of market efficiency must happen under the influence of many strong assumptions. The first assumption dictates that all participants actively take part in the market and they are rational profit maximizing investors. The second assumption states that even if there are some irrational investors in the market, the effect of their irrational trades will cancel out each other or be nullified by rational arbitrageurs. The third assumption is about the information in the market. It states that information in the market is costless and arrives at the same time for all participants. All investors react quickly to the news and make the price change accordingly.

The efficient market hypothesis was used widely and was the foundation of many modern pricing models such as the capital assets pricing model (CAPM) until it was challenged by the behavioral finance theory, which is becoming more and more popular.

2.1.2. Behavioral finance theory

Behavioral finance theory has a long history which can be traced back to the classical economics era with "The theory of moral sentiments" of Adam Smith. However, this theory is not widely accepted and until the second half of the 20th century when Tversky and Daniel Kahneman pointed out three major heuristics – representativeness, availability heuristic and anchoring and adjustment in "Judgment under Uncertainty" (1973). In 2002, the behavioral finance theory achieved its deserved recognition with the Nobel Prize of Daniel Kahneman for his study on prospect theory.

As a combination of psychology, sociology and finance, behavioral finance applies psychological theories to explain financial issues. By introducing the behavioral factor – reaction of humans under certain stimulation - to the decision making process, behavioral finance has succeeded in supplementing the standard theories of finance. Some of the underlying assumptions are counter to the assumptions about the rational behavior of market efficiency theory. According to the behavioral finance theory, market participants are irrational in the market. As a result, they often have biased expectations about the future earning of the stock they are holding. These irrationalities could appear in one individual, several people, or even in a whole system, as in the case of herding behavior. Furthermore, the market definition in behavioral finance theory is not as perfect as in the efficient market hypothesis. There is a constraint on the arbitrage opportunities in the market. These constraints could be budget limit or information mismatch which prevents arbitrageurs to make immediate modification for the market. As a result, the market price cannot be corrected instantly but continues to reflect the bias expectation of investors over a longer period of time.

In the field of behavioral finance, heuristic and behavioral bias studies play an important role in explaining the irrational behavior of market participants. Heuristics study in the psychological context is the study of the mental processes involved in problem solving with a view to gaining insight of the rule of thumb that our brain follows when we have to make a quick decision. A behavioral bias or cognitive bias is the reaction that people tend to apply under certain circumstances which leads to distortion in perception and inaccurate judgment. A number of biases have been proven to exist in the pricing decisions of market participants such as overconfidence, overreaction and underreaction, anchoring and adjustment and herding behavior. Specifically, in this study, we will concentrate on only one bias, and that is anchoring and adjustment.

2.2. Literature review on anchoring and adjustment on stock forecasting

Evidence of the anchoring and adjustment bias in stock valuation has been found in numerous studies since the 1990s. However, most of these studies were carried out using data from the US stock market and concentrate on individual investors. Recently, researchers in emerging countries have found some indications of this behavioral factor in their market participants.

De Bondt (Betting on Trends: Intuitive Forecasts of Financial Risk and Return - 1993) contributed a significant study on how anchoring and adjustment bias affects forecasts of future stock returns. In the research, De Bondt carried out at an experiment at the University of Wisconsin-Madison. The subjects of the experiment were twenty-seven students, both undergraduate and MBA students. All subjects had completed at least two courses in finance; therefore, they were familiar with basic financial knowledge as well as the market efficiency hypotheses. Six stock price charts were shown to the subjects; each chart presented the stock price for two years. The charts De Bondt used were actually the price of S&P 500 in six different time periods. Three of them featured the ending points of bull markets and the other three featured the ending points of bear markets. De Bondt asked the subjects to give their prediction of the stock price seven months and 13 months after the last price was recorded in each of the charts. Both point estimation and interval estimation were required. The students had to provide a range with a confidence interval of 80% so there was only 10% for the stock price to go over the upper tail or less than the lower tail.

With the results of the experiment, De Bondt came to these conclusions. The first finding was that most students make predictions about stock prices by extrapolating the trend they recognize from the graph. This tendency is known as "trend following" or "extrapolation bias". The second finding was that people are prone to make wider interval forecasts for stock price histories that have exhibited greater volatility. Finally, the third finding was that under the influence of anchoring and adjustment bias, people skew their interval forecasts. De Bondt suggests that there were two anchors people used in the experiment. The first anchor was the slope that students perceived from the graph. The second anchor was the average stock prices in the input data.

De Bondt's experiment can be considered as one of the first studies that prove people have a tendency to anchor their estimations when making pricing decisions. After De Bondt, more researches in the field of anchoring and adjustment in pricing activity have emerged. In those studies, the researchers not only tried to examine the existence of anchoring and adjustment bias but also wanted to quantify the effect of this factor on the stock valuation result.

In the study of Cen, Hilary, & Wei (2010), anchoring and adjustment bias is proven to have significant impact on the financial market. Using various regression models, such as the anchoring model of Sharpe and Campbell (2007), Fama French (1993), they verify that analysts make optimistic forecasts when a firm's forecast earnings per share (FEPS) is lower than the industry median while making pessimistic forecasts when FEPS is higher than the industry median. After earnings announcement dates, firms with FEPS greater (lower) than the industry median experience abnormally high (low) future stock returns. Firms with a high FEPS relative to the industry median are also more likely to engage in stock splits. Finally, split firms experience greater positive forecast revisions, larger forecast errors, and larger negative earnings surprises after a stock split compared to those that did not split their stocks, especially for firms with a low FEPS relative to the industry median.

Differing from Cen, Hilary, & Wei (2010), Oomen (2011) examined the influence of anchoring and adjustment bias on valuation without using forecasting error as a proxy. Instead, he created a model where the anchoring and adjustment factor is the dependent variable and used independent variables such as earnings volatility, company size, analysts' experience and two dummy variables to demonstrate the time of forecast and the direction of change in earning. In the study, Oomen used the IEBS data from 1988 to 2003, using two anchors such as the prior year earnings per share (EPS) and the consensus of the first three forecasts. He found out that the anchoring and adjustment factor with prior year EPS as an anchor appears more when the change between the actual EPS and the prior year EPS is positive, and when the change is negative, the consensus of the first three year forecasts is used more.

Due to the limitation of the data source, empirical studies about anchoring and adjustment in stock pricing in emerging countries are very limited. However, recently, using questionnaires and the factor analysis method, researchers outside the US have also discovered the presence of behavioral bias in stock valuation practice in their countries. Rekik & Boujelbene (2013) suggest that investors in the stock market are not really "rational". In order to investigate their irrational behaviors and figure out what affects the investment decisions of Tunisian investors, they conducted a survey with sixty-three items and divided them into six biases. With the collected data, they performed a factor analysis and concluded that Tunisian investors are under the influence of 5 groups of factors while making investment decisions. These are representativeness, herding attitude, loss aversion, mental accounting, and anchoring. Apart from these biases, when attempting to categorize Tunisian investors on the basis of demographic variables, they also found that gender, age and experience have an interaction with behavioral financial factors in investment decisions. In Vietnam, Phuoc Luong and Thu Ha (2011) performed a survey on over 170 investors in the Ho Chi Minh stock exchange. The survey contained 27 items which were classified into four main groups: Heuristics, Prospect, Market, and Herding. The result shows that there were five behavioral factors affecting the investment decisions of individual investors at the Ho Chi Minh Stock Exchange: herding, market, prospect, overconfidence-gambler's fallacy, and anchoring-ability bias. While most groups had a medium level of impact, market factors demonstrated a high level of influence on investors in the Ho Chi Minh Stock exchange. The researchers also examined the correlation between these behavioral factors and investment performance. Among all the explored factors, only three were proven to impact the investment performance: herding, prospect, and heuristic (including overconfidence and gambler's fallacy). The highest positive impact on the investment performance belonged to the heuristic behaviors while the herding behaviors affected the investment performance at the lower level. Meanwhile, there was a negative correlation between prospect factors and the investment performance. Even though they did not quantify the impact of anchoring and adjustment bias on valuation, these researchers have successfully proven that this bias exists in the stock market in Vietnam.

In this research, we want to elevate the findings of anchoring and adjustment bias on stock valuation in Vietnam by focusing on the stock analysts, who are experts in the market. Using a similar approach to that of Campbell & Sharpe (2007) and Cen, Hilary, & Wei (2010), we will find answers for the questions: Do analysts in Vietnam anchor when making pricing decisions? And: How does this bias affect forecasting results?

3. Empirical evidence of anchoring and adjustment bias in analysts' forecasts in Vietnam

3.1. The model

Our regression model is similar to the model of Campbell and Sharpe (2007) in their research on the same behavioral bias: "Anchoring bias in consensus forecasts and its effect on market prices":

$$\boldsymbol{S_t = \gamma(F_t - \bar{A}_h) + \varepsilon_t}$$

S_t is the forecast surprise (forecasting error) which is the different between the realized value, A_t, and the forecasted value, $\boldsymbol{F_t}$. $\boldsymbol{F_t - \bar{A}_h}$ is the forecast-anchor gap. $\boldsymbol{\bar{A}_h}$ is the anchor value, using the average value of A in h months.

The model can provide an effective way to verify the existence of anchoring and adjustment bias in the analysts' forecasting practice. However, when applying this model, we have to make some modifications to ensure the model fits with the data available and has no misspecification error.

Firstly, we decide which forecast value to examine. In many researches on forecasting error of stock analysts such as Amir & Ganzach (1998), Cen, Hilary & Wei (2010) and Oomen (2011), a firm's EPS value is used as a common factor to create dependent and independent variables. Moreover, Vietnamese firms' EPS values are highly accessible and forecast values for firms' EPS can be easily found in analyst's reports. Therefore, we choose to study the effect of anchoring and adjustment bias on the forecast EPS value.

Secondly, we select an anchor value to test.

In prior research such as that of Cen, Hilary & Wei (2010), the industry average value is chosen as the anchor for the forecast of stock analysts. However, in this study, we use the last quarter EPS value instead of the industry average. One reason for this substitution is that the classification of a firm's industry is complicated. Industries are classified from major – level 1, to smaller – level 2 to 4. Different industry levels have different industry averages and it is difficult to know exactly which level the analyst chooses to make comparisons with the firm. Another reason is the difference in choices of industry classification for the same firm. For example, in some reports, MSN stock belongs to the food industry; in other reports, MSN can be put in the conglomerate sector. Our decision for making the substitution is further supported by the survey we carried out in November 2012 among 88 financial analysts in Vietnam. About 87% of the analysts were asked if they agreed to use past values to help their evaluation. 48% of them strongly supported this approach[1].

The final issue with the original model involves the form of the variables. If we construct forecasting error as the difference between the forecast value and the actual value and forecast-anchor gap as the difference between the forecast value and the anchor, and run the model, the regression result will show a statistically significant relationship between the gap and the error. However, Ramsey RESET test results will pinpoint that there is a misspecification error or the model may not be in a linear form, which further leads to a doubt in the quality of the results. By taking the logarithm of the absolute value of the differences and putting them in the model, we can resolve the misspecification problem.

Denote forecasting error as *FE* formulated as $FE = log|FEPS - AEPS|$ with *FEPS* is the forecasted end of year EPS and *AEPS* is the actual EPS value at the end of the year. Hypothetically, the market is efficient and analysts are rational. The forecasting error of stock analysts will be randomly distributed:

(Equation 3.1) $$\boldsymbol{FE = \varepsilon}$$

However, if analysts are affected by the anchoring and adjustment bias, their forecast error will be influenced by the forecast-anchor gap. We name the forecast-anchor gap in this study as cross-sectional anchoring factor, *CAF*; $CAF = log|FEPS - PEPS|$ with *PEPS* is the last quarter EPS value of the firm. Adding CAF to equation 3.1, we have a single factor model:

(Equation 3.2) $$\boldsymbol{FE = c + \beta CAF + \varepsilon}$$

To further discover the effect of anchoring and adjustment on forecasting error in a multi-variable environment, we introduce more independent variables to Equation 3.2. The first variables we add is *Durarion*, the number of day from the time analyst make their prediction until the end of the year as the time when an analyst make his/her prediction is very crucial to the accuracy of the forecast. Forecast duration or forecast horizon is mentioned in many researches about the precision of analysts' prediction, such as Mouna Youssef & Mohamed Taher Rajhi (2009); Katrien Bosquet, Peter de Goeij & Kristien Smedts (2010) and Ling Cen, Gilles Hilary & K.C.John Wei (2010). It is observed in these studies that the shorter the forecast duration, the more precise the prediction. One common explanation for this phenomenon is that when it gets nearer to the earning announcement date, there are more obvious market signals as well as accurate information; therefore, analysts can make better forecast about the future price or earning of the firm. The second independent variable we add into the single factor is a dummy variable we call Group. Group takes value as 1 if the forecast is made by a group of analysts and 0 if the forecast is made by only one analyst. The reason why we use this variable will be discussed in detail in the next part of the study. Adding up all previous factors, we get the multi-variable regression model:

(Equation 3.3)

$$FE = c + \beta CAF + \gamma Durarion + \delta Group + \varepsilon$$

3.2. Hypotheses

According to the efficient market hypothesis, an analyst should be rational while making price forecasts, which means they will not be affected by behavioral bias or emotional distress. However, prior research has pointed out that in practice, analysts are biased when making pricing decisions. Some of the prominent behavioral tendencies which were discovered include over-confidence, self-confirmation, herding and anchoring and adjustment.

This study is committed to a single bias which is anchoring and adjustment, since our main goal is to answer the thesis question: "Whether or not there is an impact of anchoring and adjustment bias on the valuation results of analysts in Vietnam" To give a proper response for our major concern, we have our first hypothesis:

(i) "Analysts are affected by anchoring and adjustment bias when making forecasts."

We can test this hypothesis using Equation 3.2:

$$FE = c + \beta CAF + \varepsilon$$

Based on the regression result, we will decide whether or not to accept the hypothesis. If the regression result gives $\beta = 0$, we reject hypothesis (i) and make conclusion that analysts in Vietnam are not influenced by the anchoring and adjustment bias. Meanwhile, if $\beta > 0$, we accept the hypothesis and conclude that anchoring and adjustment bias in general make the forecast less accurate. On the other hand, if $\beta < 0$, we accept the hypothesis and conclude that anchoring and adjustment bias in general enhance the forecast accuracy.

In case the impact of anchoring and adjustment bias is confirmed from the test of hypothesis (i), we continue to find how anchoring and adjustment bias appears in both genders, male and female, because the effect of behavioral bias on different genders is one of the areas of most concern in the field of behavioral finance. A number of researches, especially researches in overconfidence, have shown that males and females are differently impacted by the emotional factors. For example, Bosquet, Goeij & Kristien Smedts (2010), while studying forecasting results of the two groups - male analysts and female analysts - proved that males are overconfident while females are not. We will conduct a similar research on the two groups of analysts, but this time for the anchoring and adjustment bias. The regression results will help us to verify the following hypothesis:

(ii) "Anchoring and adjustment bias exists in both male and female analysts."

Similar to the first hypothesis, the second hypothesis can be tested using regression results from Equation 3.2. However, the sample has to be divided into two groups which are forecasts of male analysts and forecasts of female analysts. If both β_{male} and β_{female} are different from 0. We accept hypothesis (ii). However, if there is at least one of the two β equals 0, we reject the hypothesis and make suitable conclusion based on the regression analysis.

Beside the main interest in the impact of anchoring and adjustment on forecast accuracy, we also want to know what features of the analyst can affect the precision of their predictions. Specifically, the aspect we want to study is the effect of the group and the individual on the quality of the forecast. As for the term "group" here, we do not mean to describe the forecast of analysts on a grand scale as in a consensus forecast[2] but just a team of more than one analyst who work together in order to deliver one single forecast result. While most of the prior researches are concerned about features such as gender, age and experience, whether the prediction is more accurate when the analyst makes a pricing decision alone or if it would be better for the analyst to work with others to provide more precise forecasts, is the question that is rarely touched. Noting that there is a significant percentage of reports carried by a team of analysts, we decide to apply another test. Given the hypothesis:

(iii) "Forecasting error does not depend on whether the forecaster is a single analyst or a group of analysts."

We perform the third test using the regression result of Equation 3.3:

$$\boldsymbol{FE = c + \beta CAF + \gamma Durarion + \delta Group + \varepsilon}$$

If the regression results in $\delta = 0$, we accept hypothesis (iii). Otherwise, we reject the hypothesis and make conclusion whether an analyst provide better forecast alone or in a team.

3.3. Data sources

The two main sources of data for our regression model are our analyst report collection and the EPS database provided by Stoxplus. The first source, the analyst report collection, includes a total of 661 reports which cover 191 firms listed in HNX and HOSE. Analysts' reports are collected directly from securities firms such as Viet Capital Securities (VCSC), Bao Viet Securities (BVSC) and Maybank Kim Eng Securities (MBKE), etc[3]. The oldest report was published in May 2009 and the latest report was released in December 2012. Entry data for *FEPS*, *Duration*, *Group* and also the gender of the analysts are extracted from the report collection. *FEPS* is selected directly from the stock pricing model or in the pro forma income statement at the appendix of the analyst report. In case the analyst using more than one method to price the stock, which leads to multiple EPS estimations, the average value of all EPS estimations will be recorded as *FEPS*. If the pricing model yields a range of EPS value, we will use the midpoint of that range as *FEPS*. For the calculation of *Duration*, identifying the day the analyst makes his forecast is essential. Normally, we take the released date of the report to use as the day of forecast. However, if the report clearly states that the predicted EPS value is quoted from a previous report, we will use the release date of the previous one. In order to have input data for variable *Group*, we decide to classify the owner of the report into two groups, individual and group, basing on the number of analyst whose name shows up in the Analyst/Reporter/Implementer sector of the report. If there is more than one analyst in the Implementer sector, we count the report as a group work and *Group* receives value 1. If there is no name given in the report but a phrase like "Investment and Financial Analysis Department" or "Analyst Team", we take it as the report is carried out by a group and *Group* also receives value 1. If only one analyst's name is specified in the report, we let *Group* take value 0 and further divide the individual group into male and female group. The other source of data provided by Stoxplus, one major business information providers in Vietnam, contains EPS of all firms that are listed in the HOSE and the HNX in the period between 2009 and 2012. Entry data for PEPS and AEPS which are originally from quarterly report of firms in Vietnam are collected from this source.

Regression results and analyses

First of all, we test hypothesis *(i) "The analysts are affected by anchoring and adjustment bias when making forecasts."* by running a regression model on Equation 3.2 with the whole data from 2009 to 2012. The following equation is the result of the regression model:

$$FE=1.7882+0.34996\ CAF$$

$$(Prob.= 0.0000)$$

The regression result shows that there is indeed an influence of the anchoring and adjustment factor over the forecast error of stock analysts. With the sample of all reports from 2009 to 2012, the coefficient of *CAF (β)* with a positive value indicates that anchoring and adjustment bias can cause more errors in the prediction of analysts. Correspondingly, the anchoring factor has a p value of 0.0000, which means the chance of rejecting *CAF* is 0%. So, in asset pricing practice, analysts do use past returns, in this case the previous quarter return information, as a reference point to predict the future. By giving more weight to the past return, the predictions of analysts are biased and yield more errors than they should when the analysts are bias-free. Along with this result, we accept hypothesis (i) and conclude that anchoring and adjustment bias tends to lessen the accuracy in forecasts of stock analysts.

After proving the existence of anchoring and adjustment as well as examining its effect throughout the five year period, we move on to see if the bias has the same effect on male and females and try to validate hypothesis *(ii) "Anchoring and adjustment bias exists in both male and female analyst"*. We run two separate regressions on the sample of female and male analysts and receive the results as presented in Table 1.

The empirical evidence sheds light on the fact that anchoring and adjustment bias affects both male and female analysts. The p.value of 0.0000 indicates that CAF_{male} and CAF_{female} are statistically significant. So, unlike other behavioral factors such as overconfidence, which is proved to be dominant in one gender or in some cases, overconfidence is found in only male analysts, anchoring and

Table 1: Regression results on male and female analysts

Gender	Male	Female
n	164	323
CAF (β)	0.3900	0.3667
Prob.	0.0000	0.0000
R-squared	0.1576	0.1385

adjustment exist in both genders and the impact of this bias on male analysts is similar to that on female analysts. This bias has a tendency to lower the forecast accuracy in males as well as females. $\beta_{male} = 0.3900$ is slightly higher than $\beta_{female} = 0.3667$, which means, on average, under the same effect of anchoring and adjustment bias, male analysts tend to make more forecasting errors than female analysts. With all the data and analysis above, we also accept hypothesis *(ii) "Anchoring and adjustment bias exists in both male and female analyst"*.

After testing multiple models to examine the effect of anchoring and adjustment on the forecast accuracy of the analysts, we continue to test what other factors can affect the forecasting result by using Equation 3.3.

$$FE = 1.6817 + 0.324\ CAF + 0.095\ Group + 0.0011\ Duration$$
$$(0.0000) \qquad (0.0524) \qquad (0.0000)$$

With the multi variables equation, we again retest the validity of hypothesis *(i) "The analysts are affected by anchoring and adjustment bias when making forecasts"*. The result shows the same support for the thesis as ***CAF*** is statistically significant, p. value = 0.0000, and there is no sign of change in impact direction. Anchoring and adjustment in all models so far has added up to the forecasting error, which lessens the precision in the forecast of analysts. The explained factor of the model has increased compared to that of the single factor model. Thus, even in interaction with other variables, *CAF* is still proved to be an important factor affecting the forecasting results of analysts and we confirm hypothesis (i) with the multi-variable model.

As for *Duration*, the model result gives us the exact outcome that we expected for this variable. *Duration* also has a high level of significance with 0% of being rejected based on the p. value of the model *(prob = 0.0000)*. The coefficient of *Duration(δ)* implies that the longer the duration, the larger the error. This is quite reasonable with the asset pricing practice and analysts' reporting procedure in the security in Vietnam. At the beginning of the year, ananalyst performs his valuation on a range of stocks then writes reports and gives recommendations for investors in these stocks. Throughout the year, the analyst will perform revisions of his initial forecast and make quarterly reports. Those reports will have updated company data from quarterly financial reports, incorporate forecasts involving new projects or major changes in the evaluated firm. Nevertheless, the final aim of the report is to give an estimation for the earning of the firm at the end of the year or a reasonable stock price. As the end of the year draws nearer, more information about the evaluated companies is collected and less unexpected situations are likely to happen; the analyst can combine the new information into his pricing model and the result he has will be closer to the actual value of the firm's earnings at the end of the year.

Finally, the last hypothesis, *(iii) "Forecasting error does not depend on whether the forecaster is a single analyst or a group of analysts"*, is tested. Based on the regression result, the *Group* factor does have influence on *FE*. The value of $\delta = 0.095 > 0$ shows that when there is more than one analyst involved in the forecasting process, the calculation will have greater forecasting error. The p. value equals 0.0524, which indicates that there is only a 5.24% chance to cross out the impact of *Group* on forecasting error of stock analysts. The finding leads to the rejection of hypothesis (iii) and the conclusion that when working individually, analysts tends to give better forecasts of firms' future earnings.

4. Conclusions

All the initial research questions have been answered through the findings of the thesis. Contrary to the general belief, stock analysts are behaviorally biased when making pricing decision.

The empirical evidence has shown that when forecasting future earning of a firm, stock analysts tend to fall under the influence of anchoring and adjustment bias. They anchor their predictions on the past earning of the firm then make adjustments based on that value. As a result, additional error is created which make the forecast less accurate. Regression results in a different time period also pinpoint that the influence of anchoring and adjustment bias on forecasting error is different from time to time. Even though no concrete reasons for this phenomenon can be found in the thesis, we propose an explanation: Due to the variation of macroeconomic environment condition, stock analysts will adjust themselves to be more or less dependent on the anchor value.

Furthermore, unlike behavioral bias such as overconfidence, which is prominent in male analysts, anchoring and adjustment bias appears to have substantial influence over both male and female analysts when they are making earning's forecasts. The effect of anchoring and adjustment on forecast results of male analysts is just slightly more significant compared to that of female analysts.

Even though the model can only explain 16% of the forecasting error, we consider this research to be successful. In most literature on behavioral bias in stock valuation, the R-square is less likely to be more than 10%. This figure expresses the complex nature of the forecasting error and that the behavioral bias can only contribute a portion to explain this phenomenon. Some other factors that could be used to explain the forecasting error are size effect, book-to-market ratio effect, or country risk, etc., We would like to add these factors into our model in the future. Another success of the study is to cover the gap in previous literature in Vietnam as the findings not only prove the existence of anchoring and adjustment bias on stock valuation but also show how this behavioral bias affects the actual analysts' forecasts.

APPENDIX

Survey questions for anchoring and adjustment bias

This is a portion translated from our survey carried out in November 2012, all statements are designed to identify the existence of anchoring and adjustment bias and possible anchors. 82 analysts took part in the surveys. They were asked to rank each statement from 1 to 6 according to their agreement with the content of the statement (1: completely disagree; 2: very disagree, 3: disagree, 4: agree, 5: very agree, 6:completely agree). Here are the summary of the result:

Historical data plays an important role in the pricing process. (Average: 4.5).

The following factors are important to calculate cash flow:

- Expected growth rate (Average: 4.8)
- Industry growth rate (Average: 4.6)
- Material price (Average: 4.7)
- Occurrence chance of unexpected fee (Average: 4.3)

The following factors are important in relative valuation:

- P/E or P/BV of same size companies (Average: 4.8)
- P/E or P/BV of the industry (Average: 4.4)
- EPS of same size companies (Average: 4.5)

EPS of the industry (Average: 4.2).

List of securities firms

Analysts' reports are collected directly from the websites of securities firms or through sharing of some investment online newspapers. The reports we use in the research belong to a total of 38 securities firms, namely: An Binh Securities, ACB Securities, Asian Pacific Securities, ARTEX, An Thanh Securities, Au Viet Securities, BIDV Securities, Bao Viet Securities, Euro Capital Securities, FPT Securities, HASC, Habubank Securities, Ho Chi Minh city Securities, Maybank Kim Eng, MHB Securities, Mirae asset, Mekong Securities, Mien Nam Securities, Ocean Securities, Phu Hung Securities, Phuong Nam Securities, Petro Vietnam Securities, SaigonBank Berjaya Securities, Sacombank Securities, Sai gon Hanoi Securities, SME Securities, Trang An Securities, Thang Long Securities, Tan Viet Securities, Viet Capital Securities, Viet Dragon Securities, Nhat Viet Securities, VNDirect Securities, Vina Securities, Vietstock Securities, Viet Thanh Securities, Woori, Wall Street Securities.

Statistical description of regression variables

N = 661	FE	CAF	Duration
Max	4.0663	4.2939	675.0000
Min	0.1067	-0.1024	0.0000
Median	2.8927	3.0712	143.0000
Mean	2.8336	2.9871	153.1758

Regression results

The single-factor model:

$FE = c + \beta CAF + \varepsilon$

FE: Forecasting error

CAF: Cross-sectional anchoring factor

Regression results from all data

Dependent Variable: FE
Method: Least Squares
Date: 03/16/13 Time: 08:06
Sample: 1 661
Included observations: 654
Excluded observations: 7

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.788208	0.109020	16.40251	0.0000
CAF	0.349963	0.035763	9.785667	0.0000

R-squared	0.128062	Mean dependent var	2.833596
Adjusted R-squared	0.126724	S.D. dependent var	0.595251
S.E. of regression	0.556258	Akaike info criterion	1.667884
Sum squared resid	201.7436	Schwarz criterion	1.681594
Log likelihood	-543.3980	F-statistic	95.75927
Durbin-Watson stat	1.631549	Prob(F-statistic)	0.000000

Regression results by gender

Male

Dependent Variable: FE
Method: Least Squares
Date: 03/16/13 Time: 08:20
Sample: 1 167
Included observations: 164
Excluded observations: 3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.658167	0.215357	7.699635	0.0000
CAF	0.389966	0.070848	5.504272	0.0000
R-squared	0.157553	Mean dependent var		2.818191
Adjusted R-squared	0.152353	S.D. dependent var		0.616267
S.E. of regression	0.567383	Akaike info criterion		1.716557
Sum squared resid	52.15169	Schwarz criterion		1.754361
Log likelihood	-138.7577	F-statistic		30.29701
Durbin-Watson stat	2.090555	Prob(F-statistic)		0.000000

Female

Dependent Variable: FE
Method: Least Squares
Date: 03/16/13 Time: 08:21
Sample: 1 326
Included observations: 323
Excluded observations: 3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.700149	0.152922	11.11774	0.0000
CAF	0.366651	0.051041	7.183396	0.0000
R-squared	0.138489	Mean dependent var		2.775953
Adjusted R-squared	0.135805	S.D. dependent var		0.597877
S.E. of regression	0.555799	Akaike info criterion		1.669353
Sum squared resid	99.16099	Schwarz criterion		1.692744
Log likelihood	-267.6006	F-statistic		51.60118
Durbin-Watson stat	1.425555	Prob(F-statistic)		0.000000

Regression results of multi-factor model

FE=c + βCAF + γDuration + δGroup + ε

FE: Forecasting error.

CAF: Cross-sectional anchoring factor

Duration: Number of day from forecasting date to the end of the year.

Group: Dummy variable represent group factor.

Dependent Variable: FE
Method: Least Squares
Date: 03/16/13 Time: 08:26
Sample: 1 661
Included observations: 654
Excluded observations: 7

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.681695	0.108596	15.48579	0.0000
CAF	0.323533	0.035356	9.150741	0.0000
DURATION	0.001051	0.000207	5.078928	0.0000
GROUP	0.095755	0.049277	1.943198	0.0524

R-squared	0.168400	Mean dependent var	2.833596
Adjusted R-squared	0.164562	S.D. dependent var	0.595251
S.E. of regression	0.544073	Akaike info criterion	1.626632
Sum squared resid	192.4103	Schwarz criterion	1.654052
Log likelihood	-527.9088	F-statistic	43.87534
Durbin-Watson stat	1.620109	Prob(F-statistic)	0.000000

Notes:

1. Of the 82 analysts, 71 choose option 4 or more; 34 choose 5 or 6 in question 15. See Appendix.
2. Consensus forecast is generally defined as the average of all forecasted values in the market.
3. List of securities firms can be found in the Appendix.

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