# The Investor's Guide to Classroom Bias

*Exploring the effects of educational background on overconfidence, on the financial market in Vietnam*


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**Authors:**
William Swahn & Linnea Warnemyr

**Supervisor:**
Simon Reese

## Abstract

Overconfident behaviour among investors has been marked as a substantial problem on financial markets. Consequently, many modellers and researchers have discussed the attributes of an overconfident trader, and the implications related to measuring such attributes. Since overconfidence literature can be interpreted to indicate an expectation for a relationship between educational background and overconfidence, this thesis set out to investigate this notion in the context of the Vietnamese market. First, we navigated through the controversies within the overconfidence literature to find accurate measurements. Then, an appropriate dataset was chosen, which included survey data, of measurements required, on Vietnamese investors, as well as their educational background. Last, we applied linear regression models, exploring the effect of education level, and choice of major, on the measurements chosen. We find some consistency in the results, with a few limitations. There are indications that the effect of education, on overconfidence, is influenced by the Vietnamese context as well as the nature of the measurement selected to represent overconfidence bias. There are also signs that the effect of education, on overconfidence, further depends on if the individual works within finance, or not.

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# 1. Introduction

Overconfidence has been a subject for debate in the literature of behavioural finance for a long time, although the trait was first observed in psychological studies. Usually, overconfidence refers to the trait of overestimating one's ability. It has been argued by many that overconfidence among investors creates several problems, the most mentioned being an excessive amount of trade volume (Odean, 1998; Glaser and Weber, 2007; Fellner-Röhling and Krügel, 2014). The amount of trade volume on the financial market has in turn been depicted as "perhaps the single most embarrassing fact to the standard finance paradigm" (De Bondt and Thaler, 1995, p.392). Furthermore, overconfidence also seems to significantly hurt performance (Biais, 2005).

Seeing the grave impact of the issue of overconfidence on the financial market, this bachelor thesis investigates the elements that constitute an overconfident trader. It restricts its scope to the Vietnamese market, using data provided by Vietnamese market participants in a survey conducted by Phan et al. (2018a). Specifically, this thesis explores the potential correlation between the level of education and overconfident behaviour, within the financial market in Vietnam, by investigating underlying relationships in survey reports of characteristics of Vietnamese traders.

Although overconfidence is sometimes referred to as being a single psychological bias, it is important to note that it has been measured in numerous different ways in the past. The literature as it stands today does not yet seem to have found consensus on one measurement being the most consistent with revealing overconfidence bias. Furthermore, several studies have found that these measurements are in fact not significantly correlated, indicating that overconfidence can be divided into several separate independent psychological traits. The impact of social class on overconfidence has been studied before, though interestingly not all overconfidence traits have been examined. Hence, this thesis revolves around the most frequently used and best-accepted methods to examine the effect of education on each of the overconfidence-traits independently, focusing on those which have been formerly neglected.

Our findings are to some extent unclear and unfortunately can neither prove nor disprove a general relationship between education and overconfidence on financial behaviour in Vietnam. In contrast, the results of this thesis do suggest, with some limitations and without complete certainty, that the causes of overconfidence bias depend on the specific overconfidence proxy used as the dependent

variable, as well as the physical environment. Also, according to our results, occupation is relevant for some proxies.

This thesis is divided into six sections next to this introduction. First, in the second section, it presents previous research on overconfidence. Then it establishes the theoretical framework on which it bases its assumptions. This is followed by an explanation of the problem and the hypotheses that stem from the theory and previous research. Later, the data acquired for examination is introduced, and the methodology used for analysis is provided. Thereafter, the results are reviewed and then interpreted in accordance with the literature. Last, a conclusion and a summary are given, combining aspects discussed throughout this thesis.

## 2. Previous research

The overconfidence literature originates from Psychology. However, since the overconfidence bias is so prevalent in investor behaviour, the field of behavioural economics has since then contributed greatly to the subject. This section will first glance at the literature, which treats the bias on the fundamental level, namely metacognition, and self-assessment, and then discuss the findings that have been made in the narrower scope of the financial market. Last, this section will reflect on the conflicting ideas in the literature on how to measure overconfidence accurately.

A plethora of research has been done on overconfidence within the field of Psychology. In self-assessment experiments, consensus seems to be broad that the correlation between perception of one's abilities and one's actual abilities falls in between modestly positive and negative depending on ability measured. In a well-cited study by The College Board (1976) 70% of High School students rated themselves better than average. Another study found that 94% of college faculty rated themselves better than average. Moreover, people, in general, overestimate their morality and popularity. Besides, people generally see themselves as more likely to be exposed to positive outcomes than average, while thinking they are less than averagely likely to be exposed to negative outcomes (Karpen, 2018). According to these findings, self-assessment seems to be poor, and poor self-assessment seems to be widespread across different personal characteristics.

In three separate studies by Belmi et al. (2019), with a combined sample of 152,661 individuals, it was established that people with a social class that was high relative to the sample proved to be more overconfident than their counterparts with relatively low social class. One was conducted on small business owners in Mexico, one was conducted as a multi-wave study in the US, and the

third determined that social class had the same impact on overconfidence regardless of performance advantage (Belmi et al. 2019). The construct that was used in Belmi et al. (2019) to determine social class was that of e.g. Adler et al. (2000) and Kraus et al. (2009). It holds that the factors that constitute social class are, for example, income, education, parental education, and subjective rank. Overconfidence was defined by examining *Overplacement*, which is a bias concerning how the individual ranks her ability relative to others. The aspects of *Overestimation* and *Overprecision* were purposely left aside (Belmi et al. 2019).

Many experiments have been conducted to make inferences about the effects of overconfidence on the financial market. The results have been largely consistent but have varied depending on the measurement used as a proxy for overconfidence. Frequently reoccurring measurements include *miscalibration*, *signal reliability*, and *believing to be above average*[1]. *Miscalibration* is measured by looking at what the individual believes to be her confidence intervals, which when overconfidence is present, is narrower than what truth would dictate. Originally, these confidence intervals were set on questions relating to general knowledge, for instance providing an interval for the death of Martin Luther King. However, later confidence intervals were examined on forecasts of future events (Odean, 1998; Glaser et al., 2013). *Signal reliability* is determined by recording to which extent an investor values a certain signal. If overconfidence is present, the investor will estimate the precision of the signal to be higher than what is consistent with a rational conclusion (Fellner and Krügel 2012).

In a study by Biais (2005) on *miscalibration* and self-monitoring, of the 245 graduate students in Economics and finance that were examined, there was a significant negative correlation between *miscalibration* and trading results among men. In contrast, high self-monitoring had a significant positive impact on trading results. Interestingly, no correlation could be proven regarding these attributes among women (Biais et al. 2005).

Overconfidence, measured by *signal reliability* and *believing to be above average*, has been shown to increase trade volume, whereas *miscalibration* and trade volume do not seem to be correlated (Fellner and Krügel, 2012; Glaser and Weber, 2007; Fellner-Röhling, 2014). This is inconsistent with the theoretical modelling that is presented below, which speculates that *miscalibration* and

[1] Miscalibration is a proxy for overprecision bias, signal reliability is a proxy for overestimation bias, and believing to be above average is a proxy for overplacement bias.

trade volume should demonstrate a correlation. Overconfidence across tasks is positively correlated, meaning that an individual that shows overconfidence in one task is more likely to be overconfident in another task as well. This suggests that individual characteristics would be an ingredient in overconfidence bias (Glaser et al. 2007). A study by Fellner and Krügel in 2012 claims to have proven that *signal reliability, believing to be above average* and *miscalibration* are unrelated aspects of overconfidence, and therefore are not to be mistaken for describing the same psychological bias (Fellner and Krügel, 2012). However, the proxies within a certain aspect of overconfidence are often correlated with each other. The correlation between proxies of *miscalibration,* such as *miscalibration* of general knowledge and *forecast miscalibration,* is statistically significant on the 1% level. Likewise, the correlation between proxies of *signal reliability,* such as *illusion of control* and *self-attribution,* is statistically significant to the 1% as well (Fellner and Krügel, 2012; Dorn and Huberman, 2005).

There are some issues with *miscalibration* estimates. One aspect frequently pointed out is that *miscalibration* is measured on questions of general knowledge, which might make it difficult to distinguish between overconfidence and ignorance (Glaser et al., 2013; Glaser and Weber, 2007; Fellner and Krügel, 2012). Glaser et al. (2013) reacted to these concerns by introducing an experimental market, where test subjects were asked to make predictions, or forecasts, about the future price of stocks. This measurement is, in this thesis, referred to as *forecast miscalibration.* As the truth cannot be determined beforehand, the whole population is ignorant to the answer and are only to make predictions from the signals they receive. It is argued that differences in knowledge across subjects are not relevant using this model. Accordingly, Glaser et al (2013) argue that this is a more accurate way of measuring what miscalibration has aimed to assess all along. Glaser et al. (2013) say their model 'allows "objective quantifications" of overconfidence' and claim that the model measures "true overconfidence".

The contributions of Glaser et al. (2013) also included data on professionals, as well as students. It focused on trading behaviour and overconfidence levels of the two groups. The results were in line with earlier research, from e.g. Haigh & List (2005) or Deaves et al. (2010), which had shown that professionals are highly overconfident. Furthermore, they tend to be more overconfident than students (Glaser et al. 2013).

Additionally, task difficulty has also been shown to influence overconfidence. The biases that constitute overconfidence increase as the task becomes harder, while for easier tasks test subjects even tend to be more underconfident than overconfident (Hilton et al. 2011; Glaser et al 2007).

Phan et al. (2018a), which also is the supplier of the dataset for this thesis, examined the effects of overconfidence on the Vietnamese market. The aim was to provide a comparison to studies that had previously focused on the western world, to explore the similarities and differences of Vietnamese trader behaviour in relation to the behaviours already discussed in the overconfidence literature. Vietnam provides a unique environment. For instance, the culture is quite different from the western world, and financial literacy remains constant regardless of increase in the level of education. Interestingly Phan et al. (2018a) found results that were essentially consistent with research conducted in the western world. The conclusion drawn was that, regardless of the differences in the environment that Vietnam showcases, the effects of overconfidence are virtually the same.

## 3. Theory

While this thesis has its focus on the aspects of overconfidence that lie within the field of behavioural finance, there are meaningful theoretical contributions to consider residing in Psychology. According to Pallier et al. (2002), the three main models in Psychology are: *The Heuristics and Biases Model* by Kahneman and Tversky (1996), *The Ecological Approach* by Gigerenzer, Hoffrage, & Kleinbiilting, (1991), and *An Individual-Differences Perspectiv*e by Stanovich and West (1998).

According to *The Heuristics and Biases Model*, gaps in an individual's awareness of her own ability is a result of cognitive bias and heuristics (Kahneman & Tversky, 1996). The conclusion that cognitive biases would play a role in constituting overconfidence, can be supported by research revolving around how the human brain is systematically biased when processing information, in order to strengthen an individual's self-worth. Focus is pushed towards accepting confirming and positive evidence, while contradicting and negative evidence is unsorted, dismissed, or questioned. Outcomes include tracing success back to personal characteristics, ascribing failure to circumstance or injustice, biased hypothesis testing, selective memory, and misestimation of future outcomes (Karpen, 2018). This argument may inspire a reasonable assumption that an individual, with described biases for self-serving purposes, could interpret

information in such a way that she would have greater expectations of herself than what reality may reflect. Hence, there would be a lack of harmony between her perceived ability and her actual ability.

*The Ecological Approach,* on the other hand, proposes a faulty methodology to be the main cause of high overconfidence scores. According to the model, the test subject is tricked into making a miscategorisation of the environment. The brain receives so called signals, which are interpretations of information. In the case of overconfidence experiments, it is argued that the questions, being asked, unintentionally give off signals different from the signals which are being examined. (Pallier et al. 2002). In that way, the individual thinks the correct interpretation is one that might have been correct in a different scenario, but in this scenario, it is not. This means that the individual will showcase a behaviour that is impacted by other biases than what the survey aims to assess. The result will consequently be misleading. Hence, *The Ecological Approach* disputes the extent to which overconfidence is present as a psychological self-serving bias.

Last, *An Individual-Differences Perspective* indicates that confidence judgement in part depends on the characteristics of the individual. Tendency for overconfidence has varied greatly within and across populations, suggesting that the extent to which the bias influences people's decisions can be traced back to shared traits (Pallier et al., 2002).

In addition to the attempts of explaining high overconfidence scores, effort has also been put into classifying the attitudes, which overconfidence is comprised of. Moore and Healy (2008) define three underlying biases that constitute overconfidence. They are O*verestimation, Overplacement,* and *Overprecision. Overestimation* seeks to measure the extent to which an individual believes her score to be higher than it is. *Overplacement* seeks to measure the extent to which an individual miscalculates her placement relative to others. *Overprecision* seeks to measure the extent to which an individual has an exaggerated trust in what she knows to be true (Moore and Healy, 2008).

As mentioned, *miscalibration, signal reliability,* and *believing to be above average* are frequent measurements that behavioural finance studies have selected to test overconfidence. That is because they are supposed to relate to the premises presented in Psychology already discussed (see e.g. Odean, 1998, Glaser et al., 2013, Fellner and Krügel, 2012).

The theory that has been most referred to when discussing overconfidence in finance in the past is Odean (1998) and the *miscalibration* literature revolves around this paper. Odean (1998), first and foremost, aims to model behaviour on the financial market caused by overconfidence. Arguments are, to a large extent, consistent with psychological literature. However, contributions also include analysing how the financial market is affected on the aggregate level.

The modelling in Odean (1998) is restricted to the definition of overconfidence as "a belief that a trader's information is more precise than it actually is". This corresponds to *Overprecision bias.* However, some other aspects may be able to be inferred indirectly. According to the model, there are three things that a trader considers when re-evaluating a risky asset: a private signal, analysis of market price from external signals, and prior common beliefs. If the private signal is given too high of a focus, resulting in a miscalculation of variance, overconfidence is usually determined to be present. The actual conditions are phrased as follows: "traders (1) hold posterior beliefs that are too precise and (2) overweight their own information relative to that of other [information]". The model suggests that a fair way of examining the weight given to a private signal is by making the subject give confidence intervals of 90% regarding general knowledge questions. An interval that is too narrow would suggest overconfidence (Odean 1998).

The model of *miscalibration,* by Odean in 1998, once dominated the overconfidence literature, within behavioural finance, and it is therefore still generally measured in studies on the subject (Biais et al., 2005; Glaser et al., 2013; Fellner and Krügel, 2012; Fellner-Röhling and Krügel, 2014). However, the interpretation that it truly measures *Overprecision* has been criticized to a great extent, as the conclusions made in the models do not reflect empirical findings. Furthermore, the premise that precision of information and precision of knowledge demonstrates the same bias has been questioned (Fellner and Krügel 2012).

Fellner-Röhling and Krügel (2014) propose other ways of looking at overconfidence. Their model adopts *The Coherence-Based Approach,* which originates from *The Heuristics and Biases Model,* and revolves around the notion of *signal reliability.* It stipulates that a signal with a clear indication should generate a firmer belief than a signal with a less clear indication. An investor who overestimates the precision of a given signal is considered overconfident. A score can, therefore, be determined by standardizing the distance between the investor's interpretation and a rational one.

Dorn and Huberman (2005) argue that assessing overconfidence can be done by comparing perceived attributes with objective ability. It is claimed that this method does not have the same problems as the *miscalibration model*. In the model by Dorn and Huberman (2005) an individual might predict a test score prior to the test being taken, or she may be asked to guess her rating relative to others. The difference between the predicted and actual competence is used as a proxy for determining overconfidence bias. This perspective supports two other forms of bias estimation, namely *illusion of control* and *self-enhancement attribution bias*. *Illusion of control* is related to the extent to which an investor feels that she can control results in a situation that in fact carries risk. Dorn and Huberman (2005) measure *illusion of control* by asking questions examining the test subject's perception of certainty of future outcomes, and to what degree she believes she can influence the results of her investments. The proxy for *self-enhancement attribution bias* is the extent to which investors believe themselves and their actions to be the cause of their successes (Dorn & Huberman 2005).

# 4. Problem and Hypothesis

## 4.1 Problem

Previous research has shown that overconfidence bias is prevalent in human behaviour. It is active in decision-making, causing mistakes. In finance specifically, excessive trade volume has been observed, due to overconfidence, causing inefficiency in markets and hurting profits. Understanding part of the root could prove to be helpful in countering these problems. Attempts have been made to find the source of high overconfidence scores, and though the issue of education has been analysed before and found to be explanatory, its effect on several major aspects of overconfidence has never been tested. Furthermore, the overconfidence literature has almost exclusively focused on analysing overconfidence in culturally homogeneous environments (Phan et al. 2018a), begging the question if predictions truly can be considered perfectly sound regardless of context.

## 4.2 Hypothesis

Overconfidence has been judged to be correlated across tasks. Therefore, we infer that individual characteristics are probable to affect overconfidence scores. In addition, given that overconfidence is correlated across tasks, we infer that the same individual characteristics, which have been found to be relevant to overconfidence in standard Psychology, are relevant to overconfidence on the

financial market as well. One such characteristic is education. Moreover, the fact that overconfidence seems partly rooted in an exaggeration of encouraging information would be in line with the idea that education may cause overconfidence, as education could be presumed to have such encouraging effects. This idea is exacerbated by the fact that portfolio management is a difficult task, thus increasing the likelihood of that overconfidence scores follow this pattern. Additionally, *forecast miscalibration,* measured in (Glaser et al 2013), is suggested to confirm that professionals are more overconfident than students. This thesis interprets the results as evidence promoting the idea that knowledge, experience, and past successes aggravate overconfidence. Consequently, the measurement of *forecast miscalibration* should be influenced by education level as well. As previous research seems to have recorded consistent results, when analysing each individual bias separately, this thesis hypothesises that Vietnamese investors will demonstrate behaviour in agreement with overconfidence literature.

Hence, this thesis hypothesises that the measures *signal reliability* and *forecast miscalibration* are both, independently, positively correlated with level of education among Vietnamese investors. The proxies for *signal reliability,* which are hypothesised to have a positive correlation with education level, are *illusion of control* and *self-enhancement attribution bias.* Furthermore, this thesis suspects that a major in Economics boosts this effect. Despite *believing to be above average* being mentioned, as it is an important perspective in the overconfidence literature, it will not be analysed, as it falls beyond the scope of this thesis. The reason is mainly that *believing to be above average* relates to the bias of *Overplacement,* which already was the focus of Belmi (2019).

## 5. Data and Methodology

To measure the previously hypothesised associations between education and different measures of overconfidence, a set of linear regression models have been used. Non-linear models lie outside the scope of this thesis, as does the collection of large-scale survey data. For these reasons, our econometric models are based on secondary data.

The dataset that has been used to perform the regression was retrieved from a recent study done on 621 records of Vietnamese retail investors survey replies with 3144 participants who were all engaging in trade on the Vietnamese stock market (Phan et al. 2018b). The study was conducted to examine the effects of overconfidence, along with several psychological and demographical explanatory variables, on over-trading and under-diversification (Phan et al. 2018a). This data

material contains information about several measures of overconfidence, as well as variables related to education along with financial and demographic variables. This makes the data material relevant for us to use in our attempts to answer our research question. Measurements of overconfidence that are used are *forecast miscalibration, illusion of control,* and *self-enhancement attribution*. *Forecast miscalibration* is measured by interval size, consistent with the method of Glaser et al. (2013). *Illusion of control* and *self-enhancement attribution* are measurements of *signal reliability* discussed by Dorn and Huberman (2005). *Signal reliability* is a sub-bias to overconfidence reviewed by Fellner and Krügel (2012).

The sampling method used by Phan et al. (2018a) was the random distribution of questionnaires to customers at financial institutions, students at institutions for higher education, and participants in financial training workshops. People without financial background were sampled using "the quota and snowball sampling method" (Phan et al. 2018b). In this way, the recorded data consists of individuals with varying financial backgrounds, but who are all trading in the Vietnamese financial market. As the dataset had been cleaned well, and because it already contained appropriate dummy variables for survey answer alternatives, we only had to perform minimal data preparation before we could apply linear regression.

The data preparation stage consisted of several steps. We wanted to examine the effect of education on overconfidence in terms of both *illusion of control*, *self-enhancement attribution,* and *forecast miscalibration.* They all needed slightly different treatment. Firstly, the two measures *illusion of control* and *self-enhancement attribution* were in the form of Likert data from 1-5, where 1 represented *"strongly agree"* and 5 represented *"strongly disagree"*. Because we found this order of agreement, not only counter-intuitive but also difficult to interpret, we recoded the Likert data in reverse order. Then the *forecast miscalibration* measure was defined as the difference between the upper and lower bounds of the replies to the survey question on stock index forecasting, to provide a relative proxy of the *forecast miscalibration bias*. A narrow interval would indicate a higher measure of *forecast miscalibration* as the respondent would have too high confidence in her ability to accurately estimate future stock market value.

Following the methodology of Phan et al. (2018a), we used midpoint coding for the categorical measures of *"income"* and *"Investment portfolio size"* to make them numeric. Lastly, there were many missing values in a couple of the explanatory variables that had to be dealt with. In some

cases, where it made sense and in accordance with the questionnaire, we made the missing values take on a value of zero. In the case of *"Specialization in the second degree"* many values were missing because many respondents only held one study major in their degree. To greatly reduce the number of missing values, we introduced a fourth category in this variable called *"no second major"*.

As the dataset contained many survey questions measuring the same aspect of overconfidence, we adopted a machine learning approach in the exploratory stage of analysis, to make visible general patterns among the dependent variables themselves. We wanted to investigate whether the questions seemed to contain similar information, or if they were, in fact, measuring different things. Principal component analysis was conducted to analyse questionnaire questions made for each of the two measurements *illusion of control* and *self-enhancement attribution*, respectively. By using principal component analysis, the number of survey questions was reduced into sub-measures of each aspect of overconfidence. In figure 1 of the Appendix, we observe that among the four questions measuring the *illusion of control bias*, three of them were assigned approximately equal loadings in the first and second principal component. This indicates that there is correlation between these three[2]. The first question in the questionnaire was assigned most of the loading weight from the second principal component, indicating less of a correlation between this question and the other three. As there were two distinct groups of questions, we decided to separate the two and create two different response variables for the *illusion of control bias*. This was accomplished by calculating the mean for each observation within each group. What distinguished the lone question measuring *illusion of control* was that it was a more general question and did not explicitly inquire about anything related to personal finances. It read: *"When I make plans, I am certain that they will work out"*. In contrast, the three others read: *"I always know the status of my personal finances."*, *"I am in control of my personal finances"* and *"I'm controlling and am fully responsible for the results of my investment decisions."* (Phan et al. 2018b).

Only two survey questions were formulated to measure *self-enhancement attribution* bias. They read: *"My past investment successes were, above all, due to my specific skills."* and *"My instinct has often helped me to make financially successful investments."*. In principal component analysis,

[2] Biplots are presented in figure 1 and 2 in the Appendix.

the loadings from the first principal component were quite close to each other, whereas the loadings from the second principal component were far apart. The loadings can be viewed in figure 2 of the Appendix. Since the questions were quite similar and inquiring about personal finances, we decided that splitting the two questions would bring us little to no additional useful information in our analysis, and so. Therefore, they were kept as one single measurement of the *self-enhancement attribution bias*.

The aim of this thesis is to explore the impact of education on overconfidence. The available data contained five different variables gauging the educational background of the respondents. They were: education level, first specialisation major in degree, second specialisation major in degree, whether they are a student currently, and lastly whether they are currently employed in the financial industry. For the purpose of reducing omitted variable bias, we also needed to include a vast number of control variables, along with our explanatory variables of interest, in our model selection. The control variables consisted of financial attributes, such as income level, investment portfolio size, reasons for buying or selling stocks, and sources of financial information. The psychological variable willingness to take risk was included, as well as a few demographics, such as gender and age. The large number of available control variables posed a risk of overfitting the data. To account for this risk, while also accounting for hidden dependencies among the data, a machine learning algorithm was used. More specifically, we used stepwise selection. The stepwise selection algorithm is built to minimise Akaike's Information Criterion (James et al. 2013). The scope of the algorithm ranged from only fitting the variables related to education, to a full model containing the education variables and all the control variables. Finally, four linear regression models were fitted for *illusion of control* 1, *illusion of control* 2, *self-enhancement attribution,* and *forecast miscalibration.* An interaction term was also added in all four models between education level and being employed by the financial industry, to explore any additional effects of education level on overconfidence, depending on whether the respondent is employed by the financial industry or not. To address the issue of heteroscedasticity, robust standard errors were calculated.

## 6. Results and Analysis

Data analysis shows that, for individuals without a financial occupation, there is a significant positive effect from the High School level educated category, as well as a significant negative effect from Vocational school, on the first measure of *illusion of control.* On the first measure of

*illusion of control*, for individuals with a financial occupation, the High School level category exhibits a significant negative effect, whereas Vocational School and University education show significant positive effects. We find no significant correlation between the level of education and the second measure of *illusion of control.* For *self-enhancement attribution bias,* University education, and High School education, both have significant negative effects for individuals with a financial occupation. A University degree has a significant positive effect, on *self-enhancement attribution bias,* for individuals without. Vocational school and University education have significant positive effects on Interval size for individuals working in finance. According to the results, education level and Interval size are not significantly correlated for individuals who do not work in finance. Having a first major in Economics is negatively correlated with both measures of *illusion of control* and is positively correlated with Interval size. Having a first major in Natural Sciences or Medicine does not show a significant correlation with the second measure of *illusion of control*, but, apart from that, it has the same effects as a first major in Economics. Having a financial occupation exhibits a significant positive effect on *self-enhancement attribution,* and being a student has a significant positive effect on the second measure of *illusion of control.*

The regression output is presented in its entirety below, in Tables 1 and 2. The full table with model specifications that were used is presented in Table 1 of the Appendix. The full dataset was retrieved from Phan et al (2018b). Descriptive statistics can be found in tables 1 through 4, in the article by Phan et al. (2018a).

Table 1. Linear regression table for education variables on four measures of overconfidence.

Regression table

| | **Illusion of control 1** | **Illusion of control 2** | **Self enhancement attribution** | **Interval size** |
|---|---|---|---|---|
| Education Level: High School | 0.854** | -0.117 | 0.219 | 33.481 |
| | (0.285) | (0.347) | (0.202) | (52.512) |
| Education Level: Vocational School | -0.515* | 0.311 | 0.274 | -44.794 |
| | (0.226) | (0.308) | (0.193) | (41.743) |
| Education Level: University | 0.195 | 0.165 | 0.558** | -7.685 |
| | (0.159) | (0.279) | (0.189) | (27.913) |
| Financial Occupation | 0.158 | 0.194 | 0.597*** | -7.488 |
| | (0.178) | (0.172) | (0.146) | (24.064) |
| First Major: Economics | -0.416** | -0.447** | 0.012 | 78.996*** |
| | (0.131) | (0.166) | (0.155) | (16.786) |
| First Major: Natural Sciences / Medicine | -0.337* | -0.345 | -0.017 | 104.511*** |
| | (0.137) | (0.176) | (0.170) | (20.285) |
| Second Major: Economics | -0.035 | -0.108 | 0.008 | -8.875 |
| | (0.075) | (0.114) | (0.104) | (14.385) |
| Second Major: Natural Sciences / Medicine | -0.056 | 0.111 | 0.131 | 1.150 |
| | (0.125) | (0.174) | (0.191) | (21.757) |
| Is student | 0.060 | 0.205* | 0.151 | -3.941 |
| | (0.066) | (0.103) | (0.085) | (11.857) |
| $R^2$ | 0.134 | 0.087 | 0.202 | 0.221 |
| Adj. $R^2$ | 0.084 | 0.032 | 0.134 | 0.152 |
| Num. obs. | 370 | 370 | 370 | 370 |
| RMSE | 0.560 | 0.772 | 0.658 | 93.141 |

Notes: Robust standard errors in parantheses. Education Level baseline category is 'Less than High School'.First and Second Major baseline category is 'Social Sciences / Others'. Interaction terms between Education Level and Financial Occupation are presented separately in Table 2. The Education Level coefficients in this table refer to investors not who do not have a Financial Occupation. Full table with control variables is presented in Table 1 of the Appendix. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

Table 2. Linear regression table for interaction terms on four measures of overconfidence.

Regression table of interaction terms

| | **Illusion of control 1** | **Illusion of control 2** | **Self enhancement attribution** | **Interval size** |
|---|---|---|---|---|
| Edu. Lvl. High School x Fin. Occupation | -1.546*** | 0.044 | -0.657* | -90.167 |
| | (0.439) | (0.349) | (0.276) | (59.231) |
| Edu. Lvl. Vocational School x Fin. Occupation | 1.497*** | -0.113 | 0.170 | 116.897* |
| | (0.353) | (0.350) | (0.274) | (52.452) |
| Edu. Lvl. University x Fin. Occupation | 0.829*** | -0.441 | -0.885*** | 96.935* |
| | (0.232) | (0.330) | (0.265) | (41.426) |
| $R^2$ | 0.134 | 0.087 | 0.202 | 0.221 |
| Adj. $R^2$ | 0.084 | 0.032 | 0.134 | 0.152 |
| Num. obs. | 370 | 370 | 370 | 370 |
| RMSE | 0.560 | 0.772 | 0.658 | 93.141 |

Notes: Robust standard errors in parantheses. Education Level baseline category is 'Less than High School'.First and Second Major baseline category is 'Social Sciences / Others'. Full table with control variables is presented in Table 1 of the Appendix. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

The regression results, summarized above, provide a rather conflicting picture on the relationship between aspects of overconfidence and education. For the first measurement of *illusion of control*, demonstrated in Table 1, no significant effect for a University degree can be found for individuals without an occupation in finance. For the first measurement of *illusion of control*, for investors who do not work in finance, a significant positive effect is found for High School to the 1%. However, for Vocational school, a significant negative correlation is found at the 5% level. At first, this seems inconsistent with *The Heuristics and Biases Model.* The expectation that higher social class and a belief of superior knowledge would deliver a signal that is exaggerated in the brain in obedience to the self-serving bias is not supported. The results for deriving overconfidence, represented by *illusion of control* as the dependent variable, within the boundaries of the regression, do not indicate that an investor with higher education would interpret these

signals inaccurately, or ascribe herself faulty evidence of superiority, as a result, except after a High School diploma. Nevertheless, the contradictive findings could be suspected to be influenced by the properties of the Vietnamese context. An investor, gaining consciousness about the limitations of her education, might not even receive such a signal. The results on the effect of Vocational School could be speculated to have its basis in a negative signal, originating from such a realisation. Although Phan et al. (2018a) found that the effects of overconfidence biases are not severely impacted by these circumstances, the possibility that underlying catalysts to the biases could be influenced, has not been disproven in the past. For the second measurement of *illusion of control*, which represents question 1, *"When I make plans, I am certain that they will work out."* no significant effects of educational level can be found.

Moreover, both estimates of *illusion of control* are moderately negatively correlated with a major in Economics, both with a significance on the 1% level. This contradicts the overconfidence literature even further. These findings, however, are somewhat consistent with the negative signal argument. An education closely related to finance, in a Vietnamese context, seem to further increase awareness of the lack of financial literacy, rather than contributing to the illusion of enhanced knowledge.

However, the effects of education level on overconfidence, for investors working in finance, provide a different picture. The findings, which suggest that higher education levels positively correlate with *illusion of control*, given an occupation in finance, seems contradictory to the inferences above. It could be reflected upon whether the University graduates, who choose to work in finance, are the ones who mistakenly interpret their education for a positive signal.

The lack of clarity continues throughout the findings. *Self-enhancement attribution*, for investors without a finance occupation, shows to be significantly positively correlated with having a University degree to the 1%, whereas none of the majors are significant. The answer to why the underlying traits of these overconfidence measures are different likely lies in the difference in the nature of the two estimates. Despite both being proxies of the bias *signal reliability*, the questions related to each estimate are quite different. The questions that were answered to record *illusion of control* scores, asked about investments and the control of financial decisions of the individual. The questions were, as mentioned:

"1. *"When I make plans, I am certain that they will work out"* 2. *"I always know the status of my personal finances"* 3. *"I am in control of my personal finances"* and 4. *"I control and am fully responsible for the results of my investment decisions."* (Phan et al. 2018b).

It is therefore very reasonable that the major has a greater impact on the intensity of the perceived signal than in the case of *self-enhancement attribution. Self-enhancement attribution bias* relates to the overestimation of the signal strength that one has created one's own success. This proxy intuitively feels less linked to the financial field. The questions were:
1. *"My past investment successes were, above all, due to my specific skills.''* 2. *"My instinct has often helped me to make financially successful investment''* (Phan et al. 2018b). General education can more easily be interpreted as a signal to the individual, that she has acquired tools for success, than a signal that she is in control of her finances. It is therefore not surprising that *self-enhancement attribution* was able to show positive correlation where *illusion of control* could not. Interestingly, that effect is not significantly diminished by the type of major, even though both questions still relate quite strongly to the individual's perception of financial literacy. The supposed awareness of a lack of financial literacy, which an Economics major is thought to bring, might be expected to impact the way an investor views the limitations of her investment skills. Why it does not have a significant effect, cannot be answered with complete certainty. However, it can be speculated that negative signals are, in the spirit of self –serving bias, easier to neglect when discussing concepts like "instinct" and "specific skills". The argument would be consistent with *The Heuristics and Biases Model,* which states that individuals want to trace success back to personal characteristics. The questions measuring *illusion of control* relate to the negative signal more directly, within the specific scope of Vietnamese investors, possibly making the signal harder for the brain to subconsciously ignore.

The results for *self-enhancement attribution,* for individuals with an occupation in finance, seem inconsistent with the point that overconfident graduates would be more prone to work in the financial sector. We find that higher education levels, in fact, have a negative effect on *self-enhancement attribution bias*, if the investor has an occupation in finance. We infer that the explanation possibly lies in the fact that professionals, in general, are more likely to hold diversified portfolios, whereas laymen, generally, hold more concentrated portfolios. A diversified portfolio will, generally, be less exposed to fluctuations in value. This could mean that the signals

about skills and instinct, which are the bases of the questions measuring *self-enhancement attribution*, would be less distinct for professionals. As mentioned, Fellner-Röhling and Krügel (2014), a clearer signal contributes to a firmer belief. Therefore, it would be consistent with *signal reliability* literature, that a clear signal, such as a greater fluctuation, would cause a firmer belief in instinct or skill.

The findings for the interval estimate, which corresponds to *forecast miscalibration theory,* increase doubts of consistency. A major in Economics is more positively correlated with interval size than the baseline category of Social Sciences/others, to the significance of 0.1%. This means that traders with a major in Economics are less prone to exhibit *forecast miscalibration bias* than traders with a major in Social Sciences/others. A major in Natural Sciences, or Medicine, is more positively correlated to the Interval size than baseline, with a significance level of 0.1%. This is consistent with some of our other findings, but contradictory to theory and previous research. The proposed negative signal, of knowing that one's education is irrelevant, seems to translate to *forecast miscalibration* as well. Hence, this signal is likely to manifest itself in both *Overestimation*- and *Overprecision bias*. Both Vocational school and University education show a significant positive correlation with Interval size if the individual works in finance, whereas levels of education show no significant relationship with Interval size, if the investor does not work in the financial sector. Hence, we find little consistency in the effects of level of education on *forecast miscalibration.*

Before drawing extensive conclusions, stemming from the output of the regression, it must be noted that results are to be interpreted with some caution. It must be pointed out that the linear regression framework imposes a distance of 1 between the levels of dependent variables, that are measured on a Likert scale. The affected variables are *illusion of control* and *self-enhancement attribution*. A non-linear model would resolve this issue but lies beyond the scope of this thesis, as mentioned in the methodology section. Furthermore, the values of the variables that are analysed are extracted from answers to questions that reflect theory and common practice within overconfidence literature. Overconfidence proxies that are evaluated are *illusion of control, self-enhancement attribution,* and *forecast miscalibration.* Methods to obtain values of these attitudes, used by Phan. et al. (2018a), are consistent with the literature of Glaser et al. (2013), and Dorn and Huberman (2005). Nevertheless, there are several limitations, which must be considered. The

dataset, which was adopted from Phan. et al. (2018a), only contains information about traders on the Vietnamese market. Therefore, the data could be insufficient for drawing conclusions, from the regressions, that are applicable to the western market, and on the entire world especially. Thus, conclusions will be restricted to explain behaviour on the Vietnamese market exclusively.

The Vietnamese market may be speculated to be a particularly weak proxy for the rest of the world, as relevant features do not reflect the features of western markets. For instance, Vietnamese culture is unique. And admittingly, financial literacy among investors in Vietnam is not correlated with education (Phan. et al. 2018a). If former students in Vietnam are more conscious about the limitations of their education than their counterparts in the rest of the world, due to the complete irrelevance of their education, this could pose a threat to analysing the effect of education on overconfidence. If this thought reflects the truth or not remains unclear. Although Belmi et al. (2019), as mentioned, claim that performance advantage does not diminish the impact of social class on overconfidence, that study was executed in the U.S and Mexico, where financial education is not fully redundant. Hence, the possibility of this aspect influencing results must be acknowledged, nonetheless.

In contrast, the results of Phan. et al. (2018a) show that certain trading behaviours are, to a large extent, induced by the same psychological biases for both Vietnamese investors, and investors stationed in the western world. This could be an indication that psychological biases operate under the same premises despite the differences mentioned, and that results explaining the effect of those biases, and the individual differences that constitute them, are correlated across markets. However, proving the significance of to which that link extends to the impact of education level is not within the scope of this thesis. Consequently, the evidence of a relationship can only be regarded as circumstantial at most.

## 7. Conclusion and Summary

This thesis contributes to overconfidence research by combining two distinct elements, which have never been jointly analysed in overconfidence literature before. Namely, the effect of level, and type, of education on overconfidence, and the local circumstances that constitute Vietnamese society. Both issues have been discussed briefly and independently in the past. Nevertheless, the extent to which each concern has been examined has been limited, to say the least. Both will

require further investigation. This initiative provides new insights into the roots of a widely discussed problem that continues to hurt the efficiency of financial markets.

The results are slightly conflicting, and to some extent inconclusive. This thesis is unable to identify a clear relationship between education and overconfidence on the Vietnamese market. However, there is suggestive evidence that the circumstances unique to Vietnam may impact the specific biases present in investor behaviour. In case true, it would mean that subcategories to overconfidence depend partly on the physical environment. This is inconsistent with the belief showcased in modern overconfidence literature. Moreover, the results, although not perfectly scientifically valid, may provide certain indications of the effect of education on overconfidence measures. According to the regression analysis, *self-enhancement attribution* is significantly positively influenced by the level of education on the University level compared to the baseline category *"Less than high school"*, if the trader does not work in finance. This is consistent with the hypothesis. In contrast, if the trader does work in finance, both High School and University education is significantly negatively correlated with *self-enhancement attribution.* Furthermore, a first major in Economics or Natural Sciences/Medicine is suggested to be more significantly negatively correlated with *forecast miscalibration,* compared to baseline. The hypothesis and the results are in these aspects inconsistent. And finally, findings propose that *illusion of control* is affected differently depending on the level of education and depending on whether the investor works in finance or not. A first major in Economics is also more negatively correlated with *Illusion of control* than the baseline on a statistically significant level. These findings do not reflect the clarity that was hypothesised. One thing that is clear is that whether an investor works in finance, or not, seems to be an influential factor, as results differ depending on the value taken by this binary variable.

The findings seem incompatible to some extent, and some links do not perfectly align with what can be expected after reviewing arguments made in the overconfidence literature. Hence, it might be of interest to thoroughly re-examine these relationships. Additionally, the potential remains for exploring new explanatory variables that in part constitute overconfidence biases, and the extent to which they might be causing the problem. It is of importance, as a better understanding of underlying traits would bring the academic field closer to solving an issue that continues to bring damage to the financial markets.

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Appendix

Figure 1. Biplot for the *illusion of control* survey questions:

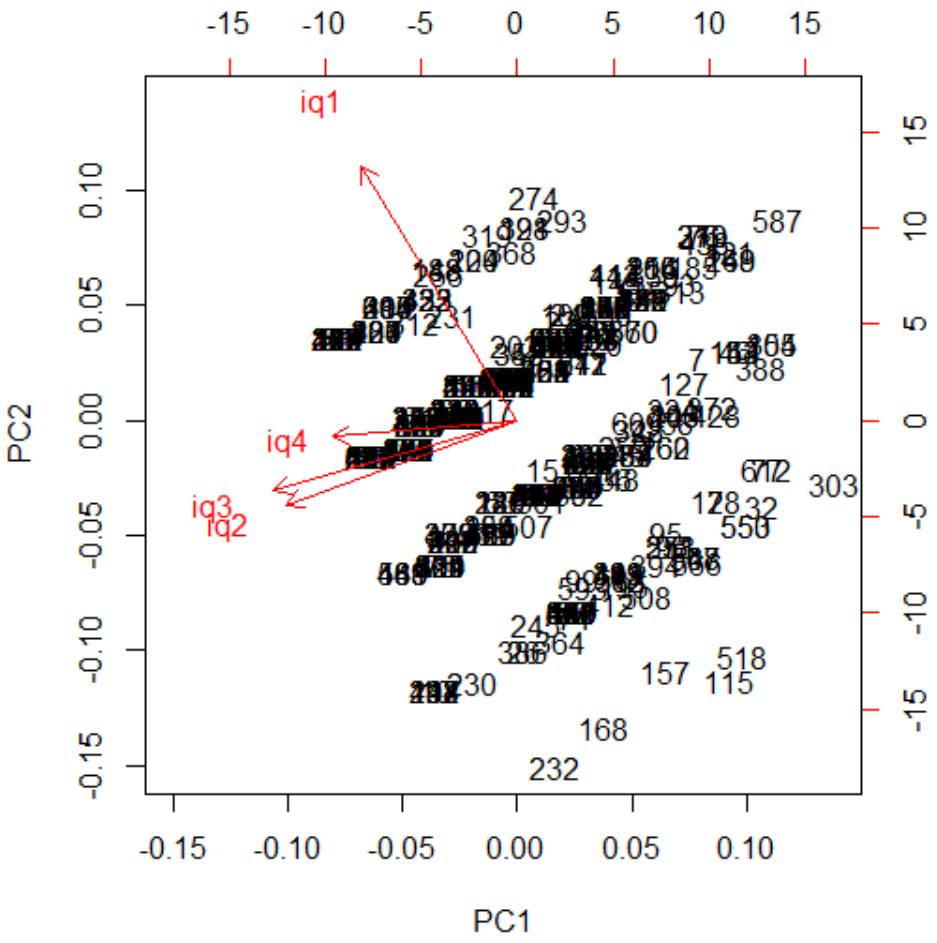

Figure 2. Biplot for the *self-enhancement attribution* survey questions:

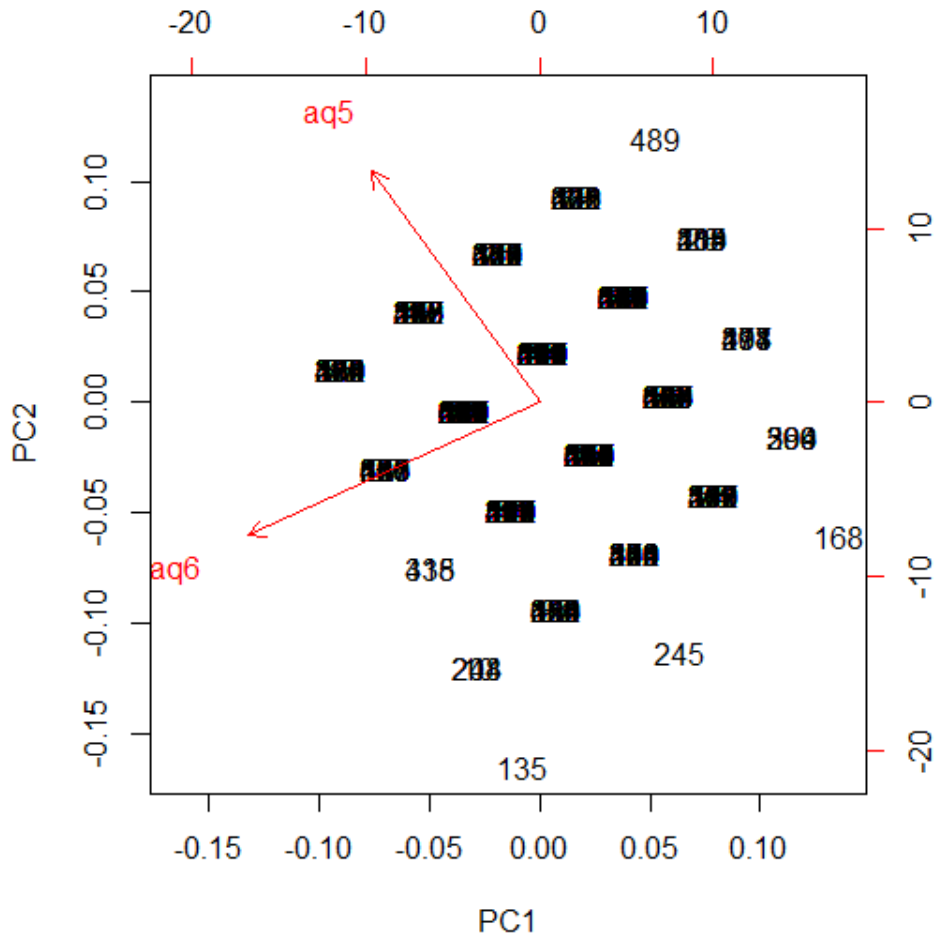

Table 1. Full regression table

Regression table with interaction terms and control variables

| | **Illusion of control 1** | **Illusion of control 2** | **Self enhancement attribution** | **Interval size** |
|---|---|---|---|---|
| Education Level: High School | 0.854** | -0.136 | -0.273 | 7.493 |
| | (0.285) | (0.212) | (0.165) | (31.571) |
| Education Level: Vocational School | -0.515* | 0.319 | 0.603*** | -24.101 |
| | (0.226) | (0.223) | (0.160) | (28.753) |
| Education Level: University | 0.195 | 0.108 | 0.369* | -7.793 |
| | (0.159) | (0.243) | (0.183) | (23.031) |
| Financial Occupation | 0.158 | 0.060 | 0.066 | 13.666 |
| | (0.178) | (0.092) | (0.079) | (10.750) |
| First Major: Economics | -0.416** | -0.439** | 0.024 | 64.079*** |
| | (0.131) | (0.166) | (0.154) | (17.268) |
| First Major: Natural Sciences / Medicine | -0.337* | -0.333 | 0.018 | 85.514*** |
| | (0.137) | (0.177) | (0.169) | (20.802) |
| Second Major: Economics | -0.035 | -0.110 | 0.004 | -6.205 |
| | (0.075) | (0.113) | (0.104) | (14.413) |
| Second Major: Natural Sciences / Medicine | -0.056 | 0.116 | 0.207 | -9.567 |
| | (0.125) | (0.171) | (0.181) | (22.105) |
| Is student | 0.060 | 0.199 | 0.121 | -4.075 |
| | (0.066) | (0.102) | (0.084) | (11.734) |
| Edu. Lvl. High School x Fin. Occupation | -1.546*** | | | |
| | (0.439) | | | |
| Edu. Lvl. Vocational School x Fin. Occupation | 1.497*** | | | |
| | (0.353) | | | |
| Edu. Lvl. University x Fin. Occupation | 0.829*** | | | |
| | (0.232) | | | |
| Age | -0.142 | | -0.196 | 48.167** |
| | (0.090) | | (0.130) | (18.474) |
| Gender(0=male, 1=female) | | | | 35.834** |
| | | | | (11.963) |
| Willingness to take risk | | 0.034 | 0.051** | 4.701 |
| | | (0.024) | (0.019) | (3.399) |

| | | | | |
|---|---|---|---|---|
| Equity portfolio value | | | 0.000** | -0.001** |
| | | | (0.000) | (0.000) |
| Number of single stocks in portfolio | | | -0.050 | |
| | | | (0.027) | |
| Reason for stock purchase: work for company | | | | 43.651* |
| | | | | (20.500) |
| Reason for stock purchase: advice from friends and family | | | | -44.310** |
| | | | | (15.372) |
| Reason for stock purchase: advice from financial advisors | | -0.194 | -0.177* | |
| | | (0.120) | (0.089) | |
| Reason for stock purchase: Launched good news of company | 0.122* | | | 26.744* |
| | (0.060) | | | (10.573) |
| Reason for stock purchase: stock price dropped considerably | | | | -18.843 |
| | | | | (10.238) |
| Reason for stock purchase: others | | | -0.195 | |
| | | | (0.136) | |
| Source of financial information: stock brokerage company websites | | | -0.205** | |
| | | | (0.074) | |
| Source of financial information: stock company conferences/workshops | | | | 28.904 |
| | | | | (19.245) |
| Source of financial information: online forum | -0.144* | -0.151 | | |
| | (0.071) | (0.097) | | |
| Source of financial information: personal contacts | | | -0.281*** | |
| | | | (0.078) | |
| Reason for selling stocks:reinvestment | | 0.140 | 0.128 | |
| | | (0.095) | (0.087) | |
| Reason for selling stocks: profit | | | 0.140 | |
| | | | (0.073) | |
| Reason for selling stocks: Reinvestment | 0.163* | | 0.162 | |
| | (0.067) | | (0.085) | |

| | | | | |
|---|---|---|---|---|
| Reason for selling stocks: Poor management of company | -0.226* | | -0.164 | |
| | (0.092) | | (0.099) | |
| Reason for selling stocks:advice from financial advisors | | 0.207 | | |
| | | (0.132) | | |
| Reason for selling stocks: reaching target/expected prices | | | 0.123 | |
| | | | (0.079) | |
| Reason for selling stocks: others | | | | 41.141 |
| | | | | (28.355) |
| Occupational status: retired | 0.481 | | | |
| | (0.453) | | | |
| Occupational status: housewife | | -1.237** | | |
| | | (0.457) | | |
| Occupational status: self-employed | 0.195* | 0.172 | 0.241* | -30.006 |
| | (0.087) | (0.118) | (0.104) | (15.299) |
| Occupational status: part-time employed | | | | -36.305* |
| | | | | (14.871) |
| Occupational status: other | | -0.872 | 0.913* | |
| | | (0.642) | (0.374) | |
| $R^2$ | 0.134 | 0.085 | 0.186 | 0.195 |
| Adj. $R^2$ | 0.084 | 0.038 | 0.126 | 0.144 |
| Num. obs. | 370 | 370 | 370 | 370 |
| RMSE | 0.560 | 0.770 | 0.661 | 93.600 |

Notes: Robust standard errors in parantheses. Education Level baseline category is 'Less than High School'.First and Second Major baseline category is 'Social Sciences / Others'. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.