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Recommended Citation

Welch, Steven, "Which Students Trade the Most? – Five Years of Evidence from Simulations in an Introductory Investments Course" (2013). *Accounting and Finance Faculty Publications*. 5.

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Which Students Trade the Most? – Five Years of Evidence from Simulations in an Introductory Investments Course

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ABSTRACT

In investment literature, overconfidence among male investors has been shown by their relatively high trading frequency in spite of the evidence that more trading reduces returns by way of transactions costs. In this study, given the assumption that modern, college-educated students taking an investments class should be better educated than the average investor, we posit that female and male students should not have a significant difference between them in (over)confidence, and therefore, trading frequency. We also introduce a new concept of whether domestic or international students trade more frequently, and posit some possible explanations for the results.

INTRODUCTION

Investment trading frequency is often cited as an example of investor confidence. There have been numerous studies put forth showing that men trade more often than women, which has been interpreted as “overconfidence.”¹ However, a few studies conclude that gender is not a significant factor in overconfidence.²

Graham, Harvey, and Huang (2009) use trading frequency as a measure of competence. They find that male investors perceive themselves to be more competent than female investors. Further, they find that investors who feel competent have higher trading frequencies than those who feel less competent. While not directly examined, one may infer that these results imply that male investors trade more frequently than female investors.

Generally, the differences in trading frequency between genders have been attributed to a miscalibration by male investors of their abilities to choose profitable investments. Deaves

¹ The most famous and most cited of these is by Barber and Odean (2001).

² For example, see Deaves, Lüders and Luo (2009).

Lüders and Luo (2009) find that miscalibration is an important reason for overconfidence. But, they also find that the perception that a trader feels that he or she is better than average plays a factor in trading frequency as well. In their study, gender was not a significant factor in trading frequency.

Most analysis involves trade-level data with investors who have investment accounts. The age of the investor has generally not been consideration. However, it is less clear how those of the college-aged population trades. Students exhibit the major trait that they are younger than the typical investor. Theory says that younger investors should be less risk-averse, on average, since they have more time to absorb losses and recover before retirement.³ Further, students in a college-level Investments course may have (or be gaining) more knowledge of investing and how investments work than those who have not taken such a course. This profile may be significantly different enough from older adult traders that we may see a difference in results.

Trinugroho and Sembel (2011) performed an experiment with undergraduate students who have some finance background, but have not yet traded in their own accounts. They found that student-traders with higher confidence traded more than those with lower confidence, especially after bad news. However, they do not distinguish between genders. Wang (2011) looks at gender differences in younger generations, defined at ages 18-45, as they pertain to investing in mutual funds. He finds that gender is the most important factor that influences the way younger generations' invest, although, knowledge, experience and income are also important.

Younger women, enrolled in a college Investments course are, arguably, as informed, as their male counterparts due to the nearly identical levels of education. Both groups learn about trading stocks and other assets at the same time. Therefore, one might expect that these women will have a similar level of confidence to men in the same class. In this paper, we posit that the difference has narrowed and should be insignificant between college-age males and females.

Another factor that does not seem to have been considered in previous studies is a possible difference between domestic (United States) students and international students. International students come from a wide variety of backgrounds and are difficult to lump into a single category. Oftentimes, students from developing countries prefer to be educated in a developed country. Only an elite group of these students are able to make it out of their home countries to receive their educations abroad. There appear to be two distinct groups of students that come to the United States (a developed country) from developing countries around the world. The first is the group that includes good students who have very high achievement levels and get good scholarship offers at schools located in the United States. The second group includes students who are from wealthy families that can afford to send their children to the United States

³ For example, see *A Random Walk Down Wall Street*, by Burton Malkiel, pp. 411.

regardless of the tuition costs. These may or may not be high achieving students.⁴ For students in either group, the ability to raise their stature in their home country by being able to receive an education abroad, in the United States, may be a confidence builder. Therefore, we may expect international students to have higher relative confidence levels, and consequently higher trading frequencies, than domestic students.

In this study, a simulated investment game was run for 12 weeks in each introductory Investments class for the past five years at an upper-Midwest liberal arts undergraduate institution.⁵ Students at this school tend to be either from the upper Midwestern United States, or of international origin, and almost all students taking this class are between the ages of 19 and 24. Approximately 90% of students enrolled in the class major in accounting and finance (a single major at this institution). The remaining students enrolled are typically management or economics majors. The number of trades for each student for each week of the game was recorded and separated into males and females and into domestic and international students. Regressions were performed to parse out the differences between groups.

The results indicate that the significant gender difference in trading frequency seen in other studies comparing men and women traders is persistent, even in college-aged, traditional students. Further, international students trade significantly more than domestic students. In order, from the least to most trades per person in the simulations was: domestic females, domestic males, international females, and international males, who traded with the most frequency. To be clear, though, there was no statistical significance between the number of trades by international females and international males. All other differences were significant.

DATA AND METHODS

Data was collected in an online simulation game. The participants were students in an introductory, undergraduate Investments class spanning from 2008 to 2012. Three different online trading platforms were used in the five year sample period. For the first two years, Stock-Trak® was used. During the third and fourth years, Investopedia Stock Simulator was used. For the most recent year, StockLinkU was used for the simulation game.

The rules for the game were generally consistent. Each student was required to trade a minimum of two trades per week for the duration of the 12 week game. Also, there were requirements to trade different types of investments, for example, stocks, ETFs, mutual funds, options, etc. This is called the “breadth” requirement. The breadth requirement has always been included as part of students’ grades, although the specifications for the requirement have changed with the different

⁴ Source: personal interviews by author with international students and international and domestic faculty.

⁵ The College of St. Benedict and St. John’s University in St. Joseph and Collegeville, MN, respectively

online platforms due to their differing capabilities. Even though some results may be affected by the differing platforms, all platforms give students an opportunity to trade in a realistic market scenario. Since our primary focus is trading frequency, we used dummies to control for the platform in the regression equation.

For this study, the primary variable with which we are concerned is the total number of trades per student. In the Stock-Trak® online trading platform, up to 200 trades were allowed in the normal course of the game and paid for with the subscription price. The student could then purchase more trades, if desired (100 trades per purchase). In the Investopedia platform, students were allowed an unlimited amount of trades. In the StockLinkU platform, students were allowed up to 500 trades. The only time the trade limit became an issue was with an individual (international, male) student who traded 1,217 times in the Investopedia platform. Such a large number of trades clearly skewed the results, especially since students were unable to trade more than 500 times in the other two platforms. For this reason the single day-trading student was removed from the sample as an outlier for testing purposes.⁶ No student ever came close to the upper limits in the two games that had limits, and only one other student exceeded 200 trades during all five years (327 trades).

As an added incentive to participate and do well in the game, the winner of each game and several runners up were awarded bonus points on the final exam based upon their portfolios' total returns. The final sample had 177 students, 113 were male, domestic students (of US origin), 27 were female, domestic students, 21 were male, international students, and 16 were female, international students. Only three students were from developed countries, two from Hong Kong⁷ and one from Sweden.⁸ Of the different platforms used, 67 students used Stock-Trak® (38%), 69 students used Investopedia Stock Simulator (39%), and 41 students used StockLinkU (23%).

A multivariate regression model is used to investigate what may affect the student's trading behavior. The model used takes the standard, linear form.

$$\ln TT = \beta_0 + \beta_1(Gend) + \beta_2(IntDom) + \beta_3(Investop) + \beta_4(StockLink) + \beta_5(Particip) + \beta_6(Course) + \varepsilon$$

The dependent variable, $\ln TT$, is the natural log of the total number of trades for each student. The independent variables of concern are gender ($Gend$) and the domestic status of the student ($IntDom$), both of which are dummy variables. For $Gend$, 0=male and 1=female, and for $IntDom$, 0=domestic and 1= international. So, the default student is the domestic male student. There are

⁶ Descriptive statistics that include this student are available upon request.

⁷ Hong Kong is considered an "advanced" or "developed" economy by many authorities due to its GDP relative to the rest of the world. See "IMF Advanced Economies List," *World Economic Outlook*, October 2012, p. 180.

⁸ Exclusion of these three participants did not materially affect the results.

two other dummy variables inserted to control for the online stock simulation platform. The default platform is Stock-Trak®. If the student participated in either the Investopedia game (*Investop*) or the StockLinkU game (*StockLink*), the dummy for that game is relevant.

There are two scalable independent variables. They are the grade for participation in the investment simulation game (*Particip*) and the overall grade the student received in the Investments course (*Course*). The student's grade for the participation portion of the investment simulation game (*Particip*) records whether or not the student actually traded at least twice per week and fulfilled the breadth requirements of the game. So, a student could receive 100% on his or her participation grade with a minimum of 24 trades (2 per week for 12 weeks), assuming the breadth requirements were met within those trades. This variable is chosen to control primarily for students who chose not to participate in the game as required, and thus, received a lower participation grade for the investment simulation. The student's grade for the entire course (*Course*) is expected to be a proxy for a student's competency in investments, generally. Good students may have a better understanding of markets and investments and how they work. This superior knowledge may inform them to trade more or less than a student with inferior knowledge of markets and investments.

EMPIRICAL RESULTS

The primary focus of the paper is to compare relative trading frequencies between genders and domestic statuses. Therefore, total trades were tracked for each student for each week of each game. These are parsed out by gender and national origin. Some descriptive statistics are found in Table 1. Since the total number of trades per student was not normally distributed, it was transformed using its natural logarithm. The transformed version of total trades is our dependent variable and is also included in Table 1.

The overall mean number of trades per student was 61 throughout the 12 week period of the simulation game. It is useful to breakdown the total trades further to see what is happening between the genders and domestic statuses. In the breakdown, male students trade more than female students, and international students trade more than domestic students. The order from least average trades to most is: domestic females (35.8 trades), domestic males (60.7 trades), international females (79.4 trades), and international males (81.1 trades), who trade most frequently. The difference seems quite large, so t-tests were performed to see if the differences are significant, given the sample sizes. There were a few students who had less than the minimum required number of trades for the entire simulation game. That, obviously, reduced the participation grades for those students. The simulation participation grades were, on average, higher than the overall course grades, though.

T-tests were performed for equivalence of means between the groups. These results are found in Table 2. In the t-tests, we compared the sample in several ways. First, using all students, we compared the means between domestic and international students. The means were significantly different. International students traded significantly more, as a group, than domestic students. The second way we compared means was using all students and looking only at gender. Males traded more than females, but the difference was not statistically significant. A third way we looked at the data was by using only the sample of female students, we compared domestic and international students. Here again, we find a significant difference. International female students trade much more than domestic female students. The fourth grouping looked only at male students, comparing domestic males with international males. In this case, although international male students did trade more than domestic male students, the difference was not statistically significant. Our fifth comparison parses out only international students, comparing males with females. The result shows that there is no gender difference in trading frequency among international students. Our sixth, and final comparison, was of domestic students comparing again males with females. Domestic male students trade significantly more than domestic female students.

Correlations among independent variables were performed see if there might be any potential for multicollinearity in the regression equation. Correlations are found in Table 3. There were several statistically significant correlations among the variables. Gender (*Gend*) and domestic status (*IntDom*) were correlated, and the Investopedia dummy (*Investop*) was correlated with *Gend* and the investment simulation participation grade (*Particip*). Fortunately, these correlations, although statistically significant are all below 0.250 suggesting that, while they are correlated, the correlation is reasonably low. Of the other variables, we found that two combinations were significantly positively correlated, *Investop* was significantly correlated with the StockLinkU dummy (*StockLink*), which is to be expected since they are two of the three platforms and they cannot both have a value of “1” at the same time. The final statistically significant correlation is between *Particip* and the overall course grade (*Course*). The correlation for this was 0.463. So, there may be some multicollinearity in the regression equation. However, when substituting the variables in and out of the equation, there seemed to be no material effect on significance of any of the variables in the regression equation. Therefore, it was decided to retain both independent variables due to their theoretical justifications described above.

The result of the multivariate regression is in Table 4. The independent variables taken together explain 41.2% of the percentage change in trading frequency. The regression coefficients are mostly significant at the 1% level. Looking at the coefficient to the student’s participation grade for the simulation game (*Particip*), for an increase of one unit (%) in the student’s participation grade for the simulation game, his or her total number of trades increases by 2.8%. the results for the coefficient of the gender dummy (*Gend*) show that being female decreases the number of trades by 25.8% which is consistent with the finding in Trinugroho and Sembel (2011). The

coefficient for domestic status (*IntDom*) indicates that being an international student increases the number of trades by 25.8%, which was consistent with our hypothesis that international students would trade more frequently. Investopedia participants had significantly more trades than those that traded using other platforms. This was expected since Investopedia was the only platform with no trading limits. *StockLink*, the dummy associated with students who participated in the StockLinkU online simulation platform, and *Course*, the student's overall Investments course grade were not significant.

The results may also help us to predict a specific number of trades that a student would make in a semester, given student's other traits. Choosing a random student, for example a female, domestic student who participated in the Investopedia platform with grades for simulation participation and the course of 85% and 91%, respectively, we may input this information into the equation and get: $\ln TT = 1.732 + 1(-0.258) + 0(0.258) + 1(0.496) + 0(0.055) + 85(0.028) + 91(-0.007)$; $\ln TT = 3.713$. Taking e to the power 3.713, we get 40.97655, or approximately 41 trades. The average domestic female student traded 36 times. This particular example student is expected to trade slightly more because she participated using in the Investopedia platform. However, she is expected to trade significantly less than the average student (mean = 61 trades) because she is both a female and her national origin is domestic.

CONCLUSION

In this paper, we revisit the idea that men trade more than women. More specifically, we attempt to find out if younger, college-aged investors exhibit the same overconfidence traits as their elder counterparts. Also, we look at domestic students and compare them to international students, parsing out both genders to see if differences in trading frequency exist there as well. Finally, we run a regression to see what factors may affect students' trading frequencies and to predict the number of trades for a given student.

We find that there are several significant differences between genders and domestic status. Domestic students trade far less than their international counterparts, regardless of gender. Also, domestic male students trade significantly more than domestic female students. However, the difference in trading frequency between genders among international students was not significant. A reason for this may be that international female students may be less risk averse than their domestic counterparts, and the gap may be wider than the difference between international and domestic male students. Since international female and male students did not statistically differ in their trading frequencies, it may be that international students have, on average, essentially the same levels of (over)confidence, regardless of gender, whereas, domestic students clearly have differing levels of confidence.

Our regression shows that simply by noticing a few traits in students entering an introductory Investments class, such as the gender and domestic status of students, we can predict 41.2% of the variation in (the natural log of) total trades within our 12-week investment simulation. Both gender and domestic status were significant predictors in the equation, as was the participation grade within the simulation itself.

In our attempt to explain the result that international students trade more frequently than domestic students, we first suggest that students from developing countries often seek to be educated in developed countries, such as the United States. The students that succeed in getting to the United States in order to receive their undergraduate education may be more confident than typical domestic undergraduate students in the United States. Therefore, we may expect international students to have higher relative confidence levels, and higher trading frequencies than domestic students. We feel that this is the best and most likely explanation. However, there are at least two possible alternate explanations. First, the desire to receive one's undergraduate education in another country may imply that such a student has a lower risk aversion than a person who chooses a domestic education. It may be true that the type of person that risks leaving his or her home country to get an education in another country may be more willing to take risks than a person who decides to be educated in his or her own country. Therefore, these students may have more confidence than the average domestic student, resulting in higher trading levels. Another possibility is that international students who prefer not to participate in many extracurricular activities may have little to do at times, and either out of boredom or refocused interest, they may trade more in the investment simulation. However, there is no clear evidence to support this hypothesis. Generally, it may be seen that the motives for international students to have more confidence than domestic students may be a fruitful avenue of research.

There is an additional factor, not considered in the paper, which may play a role in the results. A large proportion of students who enroll in this college from other countries are from Asia. Approximately 80% of international students in the sample studied were of Asian descent. China and Vietnam were the most represented individual countries. It is not known if Asian students react similarly to students from other continents. This may suggest another avenue of future research. One could compare international students from various global regions to determine risk aversion and trading frequency. In fact, there may be several lines of explorable research here comparing the behaviors of investors from developed and developing countries, especially where stock trading is a relatively new phenomenon for the average investor.

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TABLE 1: Descriptive Statistics

	<i>Total Trades</i>	<i>lnTotalTrades (lnTT)</i>	<i>Female Trades</i>	<i>Male Trades</i>	<i>INTL Trades</i>	<i>US Trades</i>	<i>F/I</i>	<i>F/D</i>	<i>M/I</i>	<i>M/D</i>	<i>Particip</i>	<i>Course</i>
N	177	177	43	134	37	140	16	27	21	113	177	177
Mean	61.04	3.91	52.02	63.93	80.35	55.94	79.38	35.81	81.10	60.74	0.9147	0.8557
Standard Error	3.43	0.05	5.87	4.10	8.77	3.56	12.87	2.22	12.21	4.26	0.0070	0.0058
Median	45.00	3.81	40.00	47.00	58.00	42.00	59.50	31.00	57.00	45.00	0.9444	0.8645
Skewness	2.20	0.55	2.12	2.18	0.74	2.94	0.84	0.91	0.72	2.66	-1.5319	-0.7430
Kurtosis	6.65	0.01	3.86	6.79	-0.95	12.75	-0.76	1.32	-1.02	10.50	2.4899	0.4611
Minimum	10	2.30	14	10	15	10	26	14	15	10	0.5250	0.6101
Maximum	327	5.79	173	327	184	327	173	69	184	327	1.0000	0.9913

F/I: Female, international students

F/D: Female, domestic students

M/I: Male, international students

M/D: Male, domestic students

TABLE 2: T-Tests for Equality of Means (Equal Variances Not Assumed)

	Mean Difference	Std. Error Difference	t	df	Sig. (2-tailed)
All Students: Domestic vs. International	-24.416	9.465	-2.580	48.508	.013
All Students: Male vs. Female	11.910	7.162	1.663	86.472	.100
Female Students: Domestic vs. International	-43.560	13.060	-3.335	15.895	.004
Male Students: Domestic vs. International	-20.352	12.936	-1.573	25.097	.128
International Students: Male vs. Female	1.720	17.743	.097	33.690	.923
Domestic Students: Male vs. Female	24.929	4.803	5.191	137.458	.000

TABLE 3: Correlations

		<u>Gend</u>	<u>IntDom</u>	<u>Investop</u>	<u>StockLink</u>	<u>Particip</u>
IntDom	Pearson Correlation	.227				
	Sig. (2-tailed)	.002				
Investop	Pearson Correlation	.006	.216			
	Sig. (2-tailed)	.933	.004			
StockLink	Pearson Correlation	.001	.080	-.439		
	Sig. (2-tailed)	.987	.290	.000		
Particip	Pearson Correlation	.021	-.025	.169	.050	
	Sig. (2-tailed)	.786	.741	.024	.506	
Course	Pearson Correlation	-.045	-.074	.091	-.025	.463
	Sig. (2-tailed)	.554	.329	.226	.737	.000

TABLE 4: Model Results

Model Summary			
R	R Square	Adjusted R Square	Std. Error of the Estimate
.657	.432	.412	.4681036921

ANOVA				
Model	Sum of Squares	df	F	Sig.
Regression	28.316	6	21.537	.000
Residual	37.251	170		
Total	65.566	176		

Coefficients				
Model	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
(Constant)	1.732	.442	3.922	.000
Gend	-.258	.085	-3.050	.003
IntDom	.258	.094	2.753	.007
Investop	.496	.086	5.760	.000
StockLink	.055	.096	.570	.569
Particip	.028	.004	6.487	.000
Course	-.007	.005	-1.392	.166