

“The Stock Market Game™ Taught Me to Be More Careful with My Money”: A Closer Look

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The Stock Market Game™ (SMG) is an investing simulation that is played nationwide by students in grades 4-12. Some researchers have provided empirical data defending the lessons students draw from the game, while others have expressed concern that the goal of short-term profit in the game teaches students the wrong lessons about financial risk. This study investigates the factors that feed into students' changing views of risk after they have played the SMG, including stock market performance and knowledge of investment concepts. The study found that students with higher learning gains in the SMG (as measured by pre/post-tests) are also more likely to report that the game changed their view of financial risk. Implications for teaching are discussed in the conclusion.

Journal of Consumer Education (2013-2014) **30**, (30-44).
<http://www.cefe.illinois.edu/JCE/archives/vol30.html>
Published online June 2015

Keywords: simulations, economic education, Stock Market Game, curriculum, financial literacy
JEL: A21

INTRODUCTION AND OVERVIEW

This study was conducted during the spring semester of the 2012 school year to gain insight into the effectiveness of various activities that students take part in while playing The Stock Market Game (SMG™). The SMG has been played by several million students across the United States since its creation. In the game, students manage a simulated \$100,000 stock portfolio. The trades that they make in the game follow the real movements of the stock market. A teacher support center provides an array of lesson plans and projects to supplement the game and to help teachers and students get started. There are also several other stock market simulations extant that are similar.

In 2002, Maier published a stinging critique of *Learning from the Market* (a companion curriculum to the SMG) and by extension the game itself. He noted the short-term nature of the game, indicated that winners were more likely created by luck than skill, and suggested that winning students would therefore gain inappropriate lessons from their success. In short, he stated that the curriculum “fails to address adequately the issue of risk” (Maier 2002). Specifically, “the competitive nature of the Stock Market Game will be a more powerful lesson than instructor exhortation regarding risk” (Maier, 2002, p. 86).

Maier's concerns have since been addressed to some extent by Walstad and Buckles' 2008 analysis of NAEP (also known as "the nation's report card") scores, which came to the astonishing conclusion that "...the only activity that shows a positive and significant relationship with test scores was participation in a stock market game or simulation...Presumably this activity reinforced economic ideas that [students] learn in a general economics course" (Walstad and Buckles 2008, 544). Furthermore, a large, nationwide, randomized study conducted by the American Institute for Research (AIR, formerly Learning Points Associates) claimed that the SMG is, in fact, a powerful learning tool (Hinojosa, T., Miller, S., Swanland, A., Hallberg, K., Brown, M., & O'Brien, B. 2009, hereafter referred to as "AIR study"). According to the summary of the AIR study, "Overall, results from the RCT showed that students who played The Stock Market Game significantly outperformed students who did not play the game on both the mathematics and investor knowledge tests" (Hinojosa et al. 2009, 3).

Additionally, AIR posed the following survey question: "The Stock Market Game taught me to be more careful with my money," a statement about which 67% of 7th-10th grade students replied that they either "agree" (42%) or "strongly agree" (25%) (Hinojosa et al., 2009, p. 68). Together, the tests results and the survey responses tend to allay fears that students were learning incorrect information from the SMG about investing that would lead them to take excessive risks with their money.

But questions remain. For instance, no study has looked at the performance of the stock market itself during the time that the AIR study was conducted. In fact, the S&P 500 was in free fall during the second half of 2008, when their data were collected. What if students who play during bear markets subsequently decide to be more careful with their money, while those who play during bull markets decide it is worth it to take more risks? And if the general performance of the market is not the only thing that drives students' views on risk, what else does? These are the questions that this paper seeks to address.

The notion of risk is one that is important in financial and consumer education. FINRA (Financial Industry Regulatory Authority), which funded the AIR study, applied the concept broadly to financial investments, asking respondents in its national survey of financial literacy: "When thinking of your financial investments, how willing are you to take risks?" (FINRA, 2013) The Council for Economic Education's National Standards for Financial Literacy summarize the importance of investment risk by noting that "investors must choose among investments that have different risks and rewards," and address it in the realm of insurance by discussing the various ways that people can respond to everyday risks (Council for Economic Education, 2013). Curriculum based on these concepts, such as *Financial Fitness for Life* (Gellman & Laux, 2011), attempt to get students to judge appropriate levels of risk to take in a given circumstance. The SMG, too, includes lessons on risk, risk tolerance, and asset diversification. In general, curriculums do not state that taking risks is necessarily "bad," but they do try to steer students toward less risky choices. This concern is motivated by empirical studies. For example, Robb (2011, p. 692, 697) applied the concept of risk to credit card use, reporting that "a significant portion of students engage in risky credit card behaviors that can have long-term implications for their financial well-being"; also that financial knowledge is associated with more responsible credit card use. Though some studies do find an association between higher financial knowledge and improved financial behavior, the results are not consistent (Robb, 2009).

METHODOLOGY

The first part of this study simply compares the performance of the stock market in two different periods with student survey items regarding attitudes toward risk. Since I did not have access to data on how much money each student gained or lost during the game, I simply looked at the overall gains or losses in the stock market versus the class average survey responses. This is appropriate since both market indices and student survey responses reflected a significant amount of data. If losses in their portfolios are what caused students to feel the need to be more careful with their money, then a majority of students would report increased carefulness in a down market. Conversely, if gains in their portfolios caused students to want to take risks, then the majority of students should report wanting to take more risks in an up market.

The second part of this study estimates the effect of SMG-related learning on changes in attitude toward risk. In order to do this, the study seeks first to establish that test score gains were in fact associated with playing the SMG. It then estimates the effect of test score gains on students' views of financial risk.

For both parts of the study, the operative words are "risk" and "careful." As noted above, the AIR study asked students to respond to the statement: "The Stock Market Game taught me to be more careful with my money." The question did not, however, give students the option of answering in the reverse: that the game taught them to take more risks, though they could "disagree" (23%) or "strongly disagree" (10%). In this study, I did give them this option:

How will the Stock Market Game affect the way you use your money?

- 1) It will probably not change the way I use my money.
- 2) It will probably make me more careful with my money.
- 3) It will probably make me take more risks with my money.

Offering students the chance to report a more risky attitude toward money makes a comparison between the two surveys less direct, which is a threat to validity. However, it is also important not to give students leading questions; failing to give students the option to answer the question in either way is also a threat to validity. I proceed with the assumption that the survey questions from the AIR study as well as from this study are comparable.

The first part of the study is a straightforward comparison of the S&P 500 stock market index and student survey responses. The rest of the methodology section is concerned with the second part of the study, which compares test score gains to student changes of viewpoint about financial risk.

The second part of the study relies on the assumption that the SMG has a causal influence on increases in student test score increases, that is, that test results reflect knowledge learned in the game rather than from unobserved variables. This was analyzed rigorously in the AIR study (Hinojosa, et al. 2009), and I did not seek to replicate their findings. However, it is important to ascertain whether this assumption is relevant to this particular sample. I looked at this assumption in two ways.

First, I compared the standardized score gains for the two studies. They turned out to be virtually identical: the AIR effect size for the Stock Market Game was .45 with a confidence interval of .29 to .62, while the effect size for the sample in this study using

questions from the same test was .46 with a confidence interval of .29 to .63. This is a good indication that the two samples are comparable for the purposes of this study.

TABLE 1.

Comparison of standardized score gains between the AIR and Day studies.

	AIR study	This study
Effect size	0.45	0.46
Confidence interval	(.29-.62)	(.29-.63)

Another way to ascertain if participation in the SMG caused test score gains was to survey students as to the amount of time they spent on various aspects of the SMG, then to examine the effect of these activities on test score gains. Students may have spent more or less time with the SMG based on the decisions of their team and the decisions of the teacher. Since these decisions were not entirely under each student’s control, this reduces the threat of endogeneity in the treatment while allowing us to get a student-level view of the way the SMG was carried out. Each student received different levels of treatment in different activities in the context of the SMG, such as worksheets, online research, participating in teamwork, and using math to guide investment decisions. By estimating the effect of the amount of time that students spent on each activity and controlling for other factors, we can find out how learning in the SMG is linked to test results (Torff and Tirota, 2010).

This method is essentially an “education production function” approach to estimating the effect of a treatment, in this case, working with a specific curriculum. I measured score gains using the linear growth model based on the one proposed by Hanushek (1979), which uses a pre-test followed by an educational intervention, and then a post-test. The pre-/post-test design obviates the need for data on innate ability and past educational attainment. Furthermore, the short time span between the tests (10-12 weeks) gives reasonable confidence that other relevant student characteristics such as family background and the influence of peers and community remained stable and can be treated as constant (Arshad, 2012). Since the particular teacher or school probably has an important effect (Wayne and Youngs, 2003), I also used classroom-level fixed effects, which control for these (Swinton, De Berry, Scafaldi, and Woodard, 2007; Arshad, 2012).

I estimated the effect of SMG learning activities on test score gains by using equation 1:

$$(1) \Delta A_i = \beta_0 + \beta X_i + \beta white_i + \beta female_i + \beta TEACHER + \varepsilon_i$$

where ΔA_i is an outcome for individual i as measured by post-test score minus pre-test score. X represents four different variables measuring the amount of time that students spend doing different activities related to the SMG, namely Teamwork, Worksheets,

Research, and Math Use. Lecture was not included, as lecture is not recommended as part of the SMG, and teachers did not report using it. "White" and "female" are dummy variables that are included as additional controls for race/ethnicity and gender, respectively. *TEACHER* is the fixed effect for a student's classroom. ε_i is the error term.

Having created a way to link the SMG to test score gains, I then estimated the effects of learning (as measured by test scores) on students' attitudes toward financial risk. Though Hinojosa et al. (2009, p. 68) found that 67% of middle school students who played the SMG intended to be more careful with their money (contrary to what critics may fear), they did not seek to find associations between changes of view of risk and test score gains. This section will attempt to fill that gap. The goal is to investigate not whether "risk" is good or bad, but to find out whether a changing view of risk in connection with the SMG is an outcome of learning gains. For this section, I use logistic regression, that is, a multiple logit model with a dummy variable as the outcome measure, indicating whether a student's view of risk changed or not as a result of the game. I estimated the model as:

$$(2) p_i = \beta_0 + \Delta A_i + \beta white_i + \beta female_i + \beta TEACHER + \varepsilon_i$$

where p_i is the probability that a student answers that the SMG will cause him or her to be *either more careful or more risky* with money. A robust outcome would give us an association between knowledge gained in the SMG and thinking about the real-life use of money. "White" and "female" are dummy variables that reflect race/ethnicity and gender, and *TEACHER* is the fixed effect for a student's classroom. ε_i is the error term. Classroom activities were not considered in this model. This model did not measure which students were predicted to get the highest test scores, but rather, which students gained the most. I also include a model regressing only on the post-test score for purposes of comparison, though I will proceed with analyzing the output of the first model.

Table 2: Teacher descriptions

Teacher	# of times teaching SMG	# of hours teaching Econ and PFL besides SMG	Curriculum used	School type/calendar/Title I
B	7	15	Wide variety: games, worksheets, simulations, readings, Virtual Business Management, and more	Regular/Traditional/No
C	6	8	SMG lessons and self-made "hands-on" activities	Regular/Traditional/No
D	3	0	Only SMG	Regular/Traditional/No Private
E	0	20	Current events	Montessori/Traditional/No
F	3	0	Only SMG	Regular/Traditional/No
H	2	30	Gen-I Revolution, Biz Kidz, and Learning, Earning, and Investing	Public charter/Traditional/No

The sampling frame for this study was the list of teachers of middle school students (grades 6-8) from one southeastern state who were participating in the 10-week SMG session in the spring semester of 2012. Seven classes were randomly selected, and of these seven, six teachers consented to involve their classes in the study. Of these six teachers, one eventually dropped out of the study. The teachers had varying levels of experience teaching economics and finance, including the SMG, as shown in the table below.

All the students who subsequently turned in their consent forms were given a pre-test and, immediately after the 10-week game, a post-test. 122 students ultimately took part in the study, which is about 1% of the 13,000 students who participated in the SMG in the state that semester. The pre- and post-test included 15 questions taken directly from the AIR test, as well as a student survey seeking participants' perceptions of the work they had done. Though work done in the SMG is generally a part of student grades, the performance on their portfolio is not. If a student did not answer a survey question, the student was not considered in the analysis of that question. Teachers were given a survey with the same questions about class activities in an effort to find divergences between what teachers thought they had taught and what the students reported.

Table 3: Descriptive statistics and pre/post differences

Teacher	Black/White/ Hispanic/Asian	Pre-test Total out of 15	Post-test Total out of 15	Difference between pre- and post-test
B	2/10/3/0	8.73	9.87	1.13
C	0/32/0/0	9.0	10.88	1.88
D	0/19/0/0	9.89	10.05	0.16
E	1/18/1/0	10.95	11.55	0.6
F	3/8/2/12	9.52	10.56	1.04
H	1/9/0/0	9.4	12.4	3.0
Total	7/96/6/12	9.58	10.89	1.3

RESULTS

The first part of this study looks at the performance of the stock market at the time that students were playing the SMG. During the semester that the AIR data were collected (Fall 2008), the S&P 500 lost 30.4% of its value—a devastating period for investors. After this experience, 67% of the students “agreed” or “strongly agreed” that “The Stock Market Game taught me to be more careful with my money.” In contrast, 23% responded “disagree” and 10%, “strongly disagree.”

During the Spring 2012 semester, the S&P 500 gained 4.1%. The subsequent survey answers that I collected yielded the following results:

How will the Stock Market Game affect the way you use your money?

- 32% It will probably not change the way I use my money.
- 55% It will probably make me more careful with my money.
- 13% It will probably make me take more risks with my money.

Figure 1. S&P 500 performance during the Fall 2008 session versus S&P 500 performance during SMG Spring 2012 session.



In 2008, 67% of students responded “agree” or “strongly agree” to “The Stock Market Game taught me to be more careful with my money.”



In 2012, 55% of students responded that “[The SMG] will probably make me more careful with my money.”

Source: Google Finance. www.finance.google.com.

Practitioners who have been using statistics from the AIR study can breathe a sigh of relief—the comparison of these results does not suggest that market performance was the overriding factor in students’ responses. In a period when the market posted

modest gains rather than catastrophic losses, students were still more than likely to report that they would be more careful with their money. The difference between a 30% loss versus a 4% gain corresponded with a 12% difference in students' answering that they will be more careful with their money.

It should be noted that the way that the question in this current study was phrased was designed to avoid "railroading" the students into a particular reply to the question (see discussion above); it is likely that the 12% gap (67% in 2008; 55% in 2012) between answers in the two time periods would have been even smaller if the questions had been phrased exactly the same way. However, this gap is still important. Students who played the game during bad times appear to be moderately more likely to see the market as a risky place. This influence on students' view of risk may have a lasting effect (Robb, 2011).

If the performance of the stock market is not the only factor that influences students' views of risk, then what else does? The second part of this study will seek to shed light on this question by measuring the effect of investor knowledge on view of risk as measured by the multiple choice test. To do this, Equation 1 (see methodology section above) shows us the link between playing the SMG and gains in investor knowledge, while Equation 2 shows us the link between investor knowledge and view of financial risk.

First, we must see if there is reason to believe that playing the SMG was the reason for the gains in test scores if the analysis is to be meaningful. Recall that Equation 1 should give us an indication of whether student activities in the game were associated with test score gains. The percentage gain from pre-test to post-test was 8.8%—approximately one letter grade. The classrooms that started with the lower scores tended to post higher score gains, an indication that the instruction was doing exactly what it should. The exception was Classroom H, which posted by far the largest gains—and which also had the most instruction in economic and finance concepts outside the SMG. There was no effect for the following variables: female, White, hours spent on research, or hours spent on worksheets.

The variable measuring hours spent doing teamwork was statistically significant, with students gaining 0.64 points on the test for each additional category of time spent reported. For example, a student who reported "3-6 hours" of teamwork throughout the course of the game is expected to gain 9 percentage points more than a student who reports spending "less than one hour" doing teamwork (See Graph 2). Another way to look at this is to say that a student whose team works rather diligently or whose teacher assigns a significant amount of teamwork is expected to gain a letter grade more than a student whose team is not very engaged with the SMG.

Is there any corroborating evidence that "teamwork" actually did impact student scores? It appears so. It should be noted that students and teachers both reported "teamwork" as the most common activity in the SMG, while neither "research" nor "worksheets" appeared to have been used very much at all. It is likely not a coincidence that the main activity reported in the game was the only student learning activity that had an effect on test scores. This, coupled with the similarities in score gains with those in the AIR study, is all sufficient evidence to proceed with the assumption that participating in the SMG has a causal effect on test score gains.

Table 3. Effect of covariates on score gains.

Variable	Post-test minus Pre-test coef/se	Post-test coef/se
Pretest		0.490*** (0.086)
Teamwork	0.640** (0.252)	0.539*** (0.204)
Worksheets	0.057 (0.338)	-0.079 (0.265)
Research	-0.249 (0.312)	-0.085 (0.253)
Math	0.344 (0.234)	0.375* (0.205)
White	1.446 (1.057)	1.188 (0.910)
Female	-0.386 (0.436)	-0.423 (0.370)
ClassH	1.202 (0.762)	1.806*** (0.581)
ClassF	0.403 (1.112)	0.576 (0.976)
ClassE	-1.315* (0.694)	-0.048 (0.575)
ClassD	1.981*** (0.622)	-1.358** (0.574)
Constant	-1.564 (2.020)	3.061* (1.727)
Adjusted R2	0.160	0.319

note: *p<.05; ** p<.01; ***p<.001

Equation 2 measured the effect of gains in investor knowledge on views of risk, using a logit model with “chance of changed view of risk” as the dependent variable. Recall that the survey question to gain this information was phrased: “How will the Stock Market Game affect the way you use your money?”

There was a difference in test score gains between students who had different responses to this question. The 33 students reporting that the game would not change their behavior increased their scores by a rather low 4.7 percentage points. The majority

of students (57) who claimed that they would be more careful scored 9.1 percentage points better, and the 13 students who said they would take more risks with their money because of the SMG improved by 15.9 percentage points. Though 8 of the students in the last group were from the same class, the model used fixed effects to control for the influence of the teacher. Two-tailed T-tests revealed that the differences between each group were statistically significant.

Table 4.

Association between change in attitude toward risk and gain score.

	Percentage point gain on test
No change	4.7
More careful	9.1
More risky	15.9

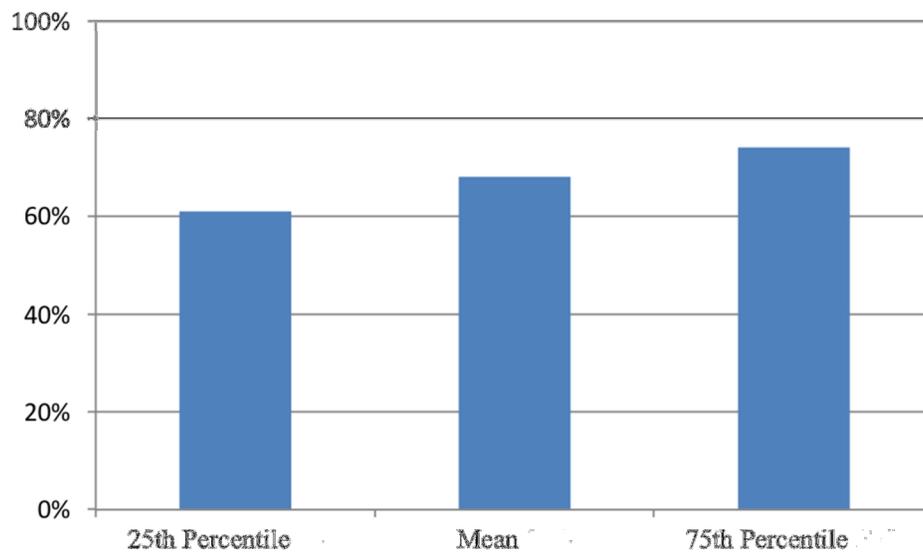
How do we account for this result? One explanation is that this result has to do with very real lessons about risk that the SMG contains. Once students finish playing the SMG, they may learn that the risks they take in the game can cause them to either lose a lot of money or to gain a lot of money. If the lesson is learned well, then some (more risk-averse) people would respond negatively to the proposition of risk, while others (who are more risk-tolerant) would respond positively. Proceeding by this logic, it is appropriate to analyze the association between a change in view of risk and score gains by examining the likelihood of a student's changing his or her view of risk *one way or the other*. For this, recall Equation 2 above.

This logistic regression analysis showed that the chance of change in view of financial risk is associated with test score gains. Being a part of classes E or F explains a rather large portion of the dependent variable. Students who were not in Class F had a 53% chance of changing their outlook on financial risk, while 93% of students in Class F changed their outlook on risk. For Class E, the numbers were 61% vs. 85%, respectively.

Even controlling for the large effects of each classroom, however, students with higher score gains were more likely to change their view of financial risk. Students in the 25th percentile of score gain were 61% likely to change the way they use their money, while students in the 75th percentile were 76% likely to change the way they use their

money.

Figure 2. Gain score vs. chance of change in view of financial risk.



Therefore students who learned their lesson in the SMG seem to not only increase their test scores, but also to change their thinking about financial risk. The majority of these students claim they will now be more careful with their money, though a small—and successful—minority say that they will take even more risks. Students who did not get the point of the game would be more likely to miss both the test questions and the significance of risk.

DISCUSSION

What did the study have to tell us about the research questions posed in the first section?

- Does the performance of the market appear to drive students' attitudes toward risk?
 - To an extent. This study suggests that the apparently conservative attitude toward money reported by students who have played the SMG should be considered in light of students' experience with gains and losses in the market. However, the study also suggests that this is not the only story.

- Is there an association between students' score gains and their attitudes toward financial risk?
 - Yes. An increase in test score appears to increase the likelihood that a student will change his or her attitude toward risk. In the majority of cases, students report that they will be more careful with their money. But a minority report that they will take more risks. In short, these results suggest that the actual financial knowledge that students gain from the game has an influence on their attitude toward how they use their money.

It is notable that Maier's (2002) critique did not call for teachers to stop using the SMG. Rather, he coupled his critiques with suggestions for classroom activities that make realities of the market, such as asset bubbles and the need for diversification, more vivid. There is nothing in this present study that suggests that such practices would be anything other than highly useful.

Teachers may also be interested in the small minority of students—in this study, 12.6% of the participants—who decided that that they should take more risks with their money as a result of the SMG. Is this cause for remediation? Apparently not, since this was also the group that had the highest test score increases. This may provide educators with an opportunity for a more nuanced view of risk. Rather than the dichotomy of "risk=bad; carefulness=good," it may be that students are learning how to more accurately weigh the value of risk. After all, people make choices about risk every day of their lives, and it is not always true that the more conservative choices are the better ones. For example, a student may run the risk of feeling embarrassed by asking a question in class, or by telling his friends that he is investing time in doing homework instead of going to the movies with them. In these cases, the issue at hand is not whether risk is generally good or bad, but rather, which risks are worth taking. We will do our students a great favor if they leave our classes knowing how to tell the difference.

CONCLUSION

The results of this study are important because they address one concern of the critics of the SMG: that students' experience with gains or losses in the market while playing the SMG will adversely affect their view of risk. This study also goes a step further and connects the highly-touted test score gains in the SMG to how students think about their money. Further research could find precise estimates of the link between stock market performance and risk. However, in the majority of instances reported here, the students reported planning to be more careful with their money as a result of the game, and those responses were affected by what students learned about investing. Teachers can take heart that on some level, their instruction about investing concepts in the SMG is hitting home.

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