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Booms, Crashes and Early Investment Experiences in a Laboratory Experiment

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Abstract

Standard economic and finance models have for the most part neglected the influence of early life experiences on economic and financial decisions. However, in recent times there has been an interest in researching the importance of early life experiences on portfolio decisions (Bucciol and Miniaci, 2011; Bucciol and Zarri, 2013, for instance). Our research tests the influence of early life experience on portfolio decisions in the laboratory. Our experiment consists of two cohorts playing an investment game in which they allocated a small amount of money between cash and stocks. The "Down" cohort started their investment allocations facing a market downturn, while the "Up" cohort started off the investment game facing returns from a stock market boom. Our main findings are as follows. First, after controlling for the effects of observable characteristics such as age, gender, financial literacy, etc., booms and busts have different effects depending on their timing. In particular, downturns that happen early in life lead subjects to allocate significantly less to

stocks. Furthermore, this effect is of a permanent nature. Subjects that faced a bust early in life tended to behave more prudently when later confronted with a boom than the subjects who started off the investment game facing a boom, a finding that lends some support to Minsky's hypothesis of endogenous financial cycles. Overall, subjects who started their investment lives facing a stock market downturn held roughly 7% less stocks than subjects that faced a stock market boom at the beginning of their investment lives. A boom early in life is associated with more stock holdings ($+ 7.54\%$; $p = 0.005$). However, the next time that subjects in the "UP" condition are faced with a boom, there is no significant effect on stock holdings, suggesting that the nature of the early boom experience is neither augmented further by the second boom, nor reduced below its prior level. In other words, the effect of the initial boom is of a permanent nature.

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Introduction & Motivation

Recent discoveries in different areas of science have shown that early life experiences have a significant impact on subsequent behavior later in life.

For example, early life stress experiences affect particular brain regions that are characterized by prolonged developmental trajectories. This explains to some extent why complex cognitive and affective brain procedures such as decision making, are more susceptible to the early life experiences. In particular, a number of studies, (Pechtel & Pizzagalli, 2011) among others, found that early life stressful events may affect the frontal lobe that is associated with high order functions, such as decision making. For example, institutionalized children show less cognitive and intellectual skills, more language problems and a 'malfunctioning psychomotor development' compared to children that grew up in their own families (Pechtel & Pizzagalli, 2011). In addition to that, findings by social psychologists suggest that early adulthood is the critical age in forming beliefs. Social psychologists also state that beliefs change slowly after adolescence and early adulthood (Giuliano & Spilimbergo, 2009).

According to biology, high or chronic levels of stress might result in the abnormal function of the Hypothalamic Pituitary Adrenal axis (HPA). During the activation process of the stress response systems, glucocorticoids are released throughout the brain and the body, and act via glucocorticoid receptors that are able to impair neural plasticity (Pechtel & Pizzagalli, 2011). As a result, particular cognitive and affective functions can be malfunctioning after Early Life Stress. In terms of affective function, one of the processes that is of major importance to the Economic and Financial Sciences is the "Reward Processing". It is the process where one evaluates and learns from the rewarding outcomes that occur in her life, and helps her predict and choose future outcomes. As such, it is a significant component of decision making (Pechtel & Pizzagalli, 2011).

The biological system that defines the Reward Processing is the Mesolimbic DA system. Dysfunction of this system coincides with early life stress events and anhedonia behavior in animals (Pechtel & Pizzagalli, 2011). (Guyer, et al., 2006) experimental study investigates behavior towards risk and rewards among maltreated and non-maltreated children, and finds that maltreated children are insensitive to high rewards–high risk options.

From a different perspective, a study by (Holman & Silver, 1998) in the field of behavioral psychology discusses the power of past experiences on present and future behavior, and its ability to change individuals' temporal orientation. Previous events in one's life may be misinterpreted and create a cognitive bias that can cause a 'trauma'. Depending on the intensity of the trauma, some of the events are likely to leave individuals 'stuck' in their prior experiences, and alter their beliefs about themselves, other people, and current events. Thus a vicious cycle is created that impairs future decisions (Holman & Silver, 1998). For example, it is found that adult women that experienced incest as children and veterans from the Vietnam War (99% men in their

sample) reported high levels of psychological distress that are accompanied by a past temporal orientation. For the women that suffered from incest in their childhood, past orientation is comparable to norms obtained from a sample of psychiatric inpatients, whereas for the veteran men the distress levels exceeded by far the levels of psychiatric inpatients. Gender differences seem to matter on the perception of prior experiences (Holman & Silver, 1998). In the same study of (Holman & Silver, 1998), Californian residents that lost their houses due to the 1993 firestorm, showed that distress over time is correlated with the degree of past orientation.

With a few exceptions, the role played by early life experiences on subsequent behavior has been neglected in the fields of Economics and Finance. Most of the studies explore the effect of early life events, like booms and crashes, on risk aversion. For example, (Malmendier & Nagel, 2011) find that households that went through high stock market returns present an increased willingness to take financial risks. A recent study by (Bucciol & Zarri, 2013) shows that financial risk aversion is also affected by idiosyncratic personal shocks and not just by aggregate-type shocks of the kind studied by (Malmendier & Nagel, 2011). According to (Malmendier, Tate, & Yan, 2011), one's personal history can affect decision making. (Bucciol & Zarri, 2013) show evidence that risk aversion is positively correlated with idiosyncratic negative experiences, like the loss of a child, or being present in a major natural disaster, but not with events like severe illness, burglaries, and robberies. Specifically, the loss of a child seems to totally offset any kind of additional financial sophistication provided by a college education, while being present during a natural disaster seems to have a long-term negative effect on financial risk-taking.

On the other hand, there is some evidence that "difficult life experiences" can help individuals strengthen their characters and personalities, if processed in a forward-looking way that prevents getting them stuck in their past trauma (Pals, 2006)

Given the findings on the importance of early life experiences on subsequent behavior, the purpose of this paper is to extend and analyze how prior events will affect economic and financial decision making. In particular, we want to advance our understanding of how prior booms and busts affect people's portfolio decisions involving a choice between a risky asset (stock) and a safe asset (cash) in the context of a laboratory experiment.

Our research continues these recent contributions by testing the influence of early life experience on portfolio decisions in the laboratory. Our main finding is that subjects that start their investment life with a sharp down market tend to behave more prudently during booms, a finding that lends some support to Minsky's hypothesis of endogenous financial cycles. Specifically, we find that subjects that started the investment game with a bust hold roughly 7% less stocks than subjects that started off with a boom, after controlling for observable subjects' characteristics such as age, gender, degree of financial experience, etc. A boom early in life is associated with more stock holdings (+ 7.54%; p = 0.005). However, the next time that subjects in the "UP" condition

are faced with a boom, there is no significant additional effect on stock holdings, suggesting that the nature of the early boom experience is neither augmented further by the second boom, nor reduced below its prior level. In other words, the effect of the initial boom is of a permanent nature.

Experimental Design & Procedures

An experiment was designed in which the subjects made repeated asset allocation decisions choosing between a risk free asset and a risky asset. The risk free asset had constant return of 4% while the risky asset returns were those of the Dow Jones Industrial Average (DJIA). The subjects were divided into two groups. One group experienced returns from 1925-1944 the other from 1929-1948. Returns over that period are shown in Table 1.

One of the behaviors examined in the paper is how the initial asset returns affect subsequent subject behavior. One group experiences mostly positive returns for the first four periods while the second group experiences four periods of large negative returns. As seen in Table 1, in the Up condition the initial returns on Stocks for Years 1-4 are 30%, 0.3%, 29%, and 48%; in the Down condition the initial returns on Stocks for Years 1-4 are -17%, -34%, -53%, and -23%. The annual returns on the stock investment from Years 5-20 in the Up condition are identical to the returns in the Down condition from Years 1-16. Table 1 summarizes the information on the stream returns each group faced.

Subjects made allocation decisions using a spreadsheet interface which is shown in Table 2. Each subject was given a $5.00 endowment to begin the experiment. Each 'Year', the subject chose how to invest their endowment. The subjects had two investment choices: United States Stocks (S), Cash (C). To make an asset allocation decision a subject would enter a number in the appropriate cell for a chosen investment. For example, if a subject chose to invest 50% of his funds in United States Stocks for that year, he would enter 50 in the Asset Allocation Column for US Stocks. A spreadsheet was built with checks and controls to insure accuracy in decision entry. Once a subject was satisfied with his or her asset allocation decisions for a particular year, he or she would then click a 'Final Decision' button on the spreadsheet and the investment returns for that year would be displayed. After a subject had finished reviewing the results, he or she would then click a button to begin making decisions for the next year (Table 2).

Subjects were recruited through an advertisement in the campus mail sent to all University of Nevada, Reno staff employees, approximately 1400 employees. The flyer stated that a subject could earn between $5.00 and $50.00 depending upon performance for participation in a one hour experiment on investment decision making. Fifty nine subjects signed up to participate in the experiment.

The experiment was conducted in a computer lab in the College of Business at the University of Nevada, Reno. Upon sitting down, each subject received a

copy of the human subject consent form and condition instructions. The experiment began with the reading aloud of the consent form and instructions. After consent was obtained, each subject received a $5.00 show-up fee. Since the recruitment flyer stated that subjects would receive a minimum compensation of $5.00, the show-up fee was given to fulfill this promise. Subjects were then told that any further compensation in the experiment was contingent on their performance in an asset allocation task.

After all the instructions were read and questions answered, the subjects then made two practice decisions for which they were not paid. After their practice decisions, the subjects had a final opportunity to ask any remaining questions. Each subject then proceeded at his or her own pace in making their asset allocation decisions for each of the 20 years. Most subjects took 25 to 45 minutes to make all of their decisions. After all the decisions were completed, each subject filled out a short questionnaire and a receipt documenting their earnings. Each subject then walked to the back of the room where they were paid individually and anonymously in cash for their performance, thanked, and dismissed from the laboratory.

The subject pool was 41% male and 59% female. The average age of participants was 40, with 19% in the 18-25 age bracket, 37% in the 25-39 age bracket, 31% in the 40-59 age bracket and 14% were 60 or older. Each subject was asked to self report on how much experience he or she had with investment decisions similar to those in the experiment. On a 1-7 scale (1= none at all, 7 =a great deal) the average response to this investment experience question was 3.2, with 36% answering 1 or 2, 58% answering 3, 4 or 5, and 7% answering 6 or 7.

Results

As shown in Table 3 and in the first regression, busts have different effects on the two groups after controlling for observable characteristics such as gender, age, etc. The group that started off with a downturn was badly affected during the bad years 1-4 (Down 14 variable), holding 7% less stocks than in the good years, and also relative to all the years of the UP group. However, the UP group was not affected in the bad years (variable UP58 turned out to be insignificant). Other correlates show results that are typical in the literature. For instance, Males hold more stocks than females, and stocks act as a hedge providing subjects with high returns in the bad times (when their account balances are low), as shown by the C-CAPM variable coefficient being positive and significant. Age turned out to be insignificant.

How persistent are the effects of a bad early life experience on the DOWN group? As regression (2) in Table 3 shows, the effects of a bad early life experience are of a permanent nature for the DOWN group, as indicated by the DOWN group dummy variable's estimated coefficient of -7.5 (p = 0.0001).

As shown in Table 3, regression (3), booms have different effects on the two groups after controlling for observable characteristics such as gender, age, etc.

A boom early in life is associated with more stock holding, as shown by the variable UP14 displaying a positive coefficient that is significant at the 1% level. However, for the group that started off with a downturn, the boom years do not coincide with more stock holding; on the contrary, during years 5-8 (boom years for the DOWN group), stock holdings are lower for this group, both compared with themselves in all other years, and also compared to the UP group. This suggests that the effect of the early bad experience was very strong for the DOWN group.

Would the result that we just got for the DOWN group in the boom years (variable DOWN58) hold if we control for the fact that the boom came immediately after a downturn for this group? (DOWN). As Table 1, regression (4) shows, the variable DOWN14 is added to our prior regression and prior results stay unchanged.

We now turn to the effects of booms. Is the early boom effect for the UP group persistent? What will happen the next time they experience a boom? Will there be more stock holding associated with the second boom? As regression (5) in Table 3 shows, the next time that subjects in the UP condition are faced with a boom, there is no significant additional effect on stock holdings, suggesting that the nature of the early boom experience is neither augmented further by the second boom, nor reduced below its prior level. In other words, the effect of the initial boom is of a permanent nature.

The final question we address in Table 3, regression (6) has to do with the effect that booms have on the DOWN group. As regression (6) shows, the DOWN group held less stocks during the years that the group faced a boom than it did in any other years, or compared to the UP group in any year (coefficient of DOWN58= -6.79, p=0.012)

Discussion of Results

In this paper we study how early life experiences affect portfolio decisions. We use data from a laboratory experiment to study the influence of busts and booms on future stock allocations. We find that the effects of busts early in life are strong and of a permanent nature, which comes in support to the findings of (Cohn, Fehr, & Maréchal, 2012). Our study also complements the results of (Giuliano & Spilimbergo, 2009) that 'shocks do have long-lasting effects in the stock market participation'. On the other hand, the early 'good' life experiences neither augment nor reduce the level of stocks during the next boom, suggesting that the effects of such experiences are also permanent. This is inconsistent with another finding of (Malmendier & Nagel, 2011) which suggests that households that went through high stock market returns are more willing to take financial risks later in the future. In the same line with other studies we find that males hold more stocks than females.

This research sheds light on the importance of early life experiences towards decision making, while also provides empirical evidence for the endogeneity of financial cycles. Our study extends the effects of prior events to economic and

financial decision making, complementing the findings of (Pechtel & Pizzagalli, 2011) on biological responses and (Holman & Silver, 1998) on psychological effects, respectively. This also complements studies, such as (Malmendier, Tate, & Yan, 2011) and (Bucciol & Zarri, 2013), concerning the effect of personal life experiences on financial decisions.

Concluding remarks and open lines for further research

Overall, the findings of this study have important implications for one's economic and financial behavior. Our empirical results shed light on the effect of busts and booms early in life on future financial decisions.

Nevertheless there are many questions that remain open. For example, how do social and personal events correlate with early financial experiences, and how do they influence risk-taking? Future research plans include analyzing a new set of data that consists of a longitudinal survey which concerns psycho-social factors, such as personal characteristics, socio-economic circumstances, and so on, to complement the study by (Bucciol & Zarri, 2013)

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Table 1. *Returns Experienced by Different Groups*

		Annual Return on Stock Investment	
Year	Cash	Up Condition	Down Condition
1	4%	30%	-17%
2	4%	0%	-34%
3	4%	29%	-53%
4	4%	48%	-23%
5	4%	-17%	67%
6	4%	-34%	4%
7	4%	-53%	39%
8	4%	-23%	25%
9	4%	67%	-33%
10	4%	4%	28%
11	4%	39%	-3%
12	4%	25%	-13%
13	4%	-33%	-15%
14	4%	28%	8%
15	4%	-3%	14%
16	4%	-13%	12%
17	4%	-15%	27%
18	4%	8%	-8%
19	4%	14%	2%
20	4%	12%	-2%

Table 2. *Subject User Interface*

FINAL DECISION
Click here after you have made your asset allocation decisions.

Year	Beginning Account Balance ($)	% Asset Allocation to: Cash	U.S. Stock Index Fund	Total Allocation (Must Sum to 100%)	Portfolio Expected Return %	Portfolio Standard Deviation %
Practice 1	5.00	25	75	100%	6.8%	15.0%
Practice 2	5.80	10	90	100%	7.3%	18.0%
1	5.00	0	100	100%	7.7%	20.0%
2	6.50	0	100	100%	7.7%	20.0%
3	6.52	0	100	100%	7.7%	20.0%
4	8.40	0	100	100%	7.7%	20.0%
5	12.45	0	100	100%	7.7%	20.0%
6	10.31	0	100	100%	7.7%	20.0%
7	6.83	0	100	100%	7.7%	20.0%
8	3.23	0	100	100%	7.7%	20.0%
9	2.49	0	100	100%	7.7%	20.0%
10	4.14	0	100	100%	7.7%	20.0%
11	4.32	0	100	100%	7.7%	20.0%
12	5.98	0	100	100%	7.7%	20.0%
13	7.46	0	100	100%	7.7%	20.0%
14	5.01	0	100	100%	7.7%	20.0%
15	6.42	0	100	100%	7.7%	20.0%
16	6.23	0	100	100%	7.7%	20.0%
17	5.44	0	100	100%	7.7%	20.0%
18	4.60	0	100	100%	7.7%	20.0%
19	4.95	0	100	100%	7.7%	20.0%
20	5.64	0	100	100%	7.7%	20.0%

Table 3. *Regression analysis. Two year averages of data*

	Full Sample (1)		Full Sample (2)		Ful sample (3)		Full Sample (4)		Full Sample (5)		Full Sample (6)	
	coeff.	p	coeff.	p	coeff.	p	coeff.	p	coeff.	p	coeff.	p
MALE	7.06	0.000	8.15	0.000	7.28	0.000	7.60	0.000	7.12	0.000	7.32	0.000
AGE	0.18	0.001	0.21	0.000	0.19	0.001	0.20	0.000	0.19	0.001	0.19	0.001
C-CAPM	14.77	0.000	15.78	0.000	14.96	0.000	15.26	0.000	14.81	0.000	15.00	0.000
DOWN14	-7.85	0.004	N/A	N/A	N/A	N/A	-8.30	0.002	N/A	N/A	N/A	N/A
UP58	1.32	0.619	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DOWN	N/A	N/A	-7.52	0.000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
UP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
UP14	N/A	N/A	N/A	N/A	7.55	0.005	6.62	0.013	8.46	0.002	7.70	0.004
DOWN58	N/A	N/A	N/A	N/A	-6.92	0.010	-8.03	0.003	N/A	N/A	-6.79	0.012
UP912	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.86	0.486	1.09	0.685
constant	40.90	0.000	41.77	0.000	39.78	0.000	40.15	N/A	39.14	0.000	39.56	0.000
Observations	1179		1179		1179		1179		1179		1179	
F (5, 1173)	35.36											
F (4, 1174)			47.40									
F (5, 1173)					37.00							
F (6, 1172)							32.61					
F (5,1173)									35.59			
F (6,1172)											30.84	
prob > F(.)	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
Adj-R-Sq.	0.1273		0.1361		0.1325		0.1387		0.1280		0.1319	

Notes: Gender: 1, if Male; 0 if Female; Age: Years of age for subject i (i = 1…59); C-CAPM: Covariance between (1/account balance) and Dow Jones stocks' returns; DOWN14: Dummy variable (1 if years 1 through 4 for cohort DOWN, 0 otherwise); UP58: Dummy variable (1, if years 5 through eight for cohort UP; 0 otherwise);

Figure 1. *Subject Interface for Entering Estimate of Stock Returns*

Year	P1
Last year you estimated the return on Stocks would be:	?
The actual return on stocks last year was:	?
For your estimate last year you will receive payment of:	?
Your total earned so far for your estimates is:	?

Please enter a number (-100.0 to +100.0) in the cell below:

What do you believe the % return on the Stock Index will be in the next year of this experiment? If your estimate is within +/- 10% of the actual return you will be paid $0.25.

Enter Number Here