

Do Humans Perceive Temporal Order in Asset Returns?

Jasmina Hasanhodzic

Boston University

Joint with Andrew Lo and Emanuele Viola

May 15, 2012

Motivation

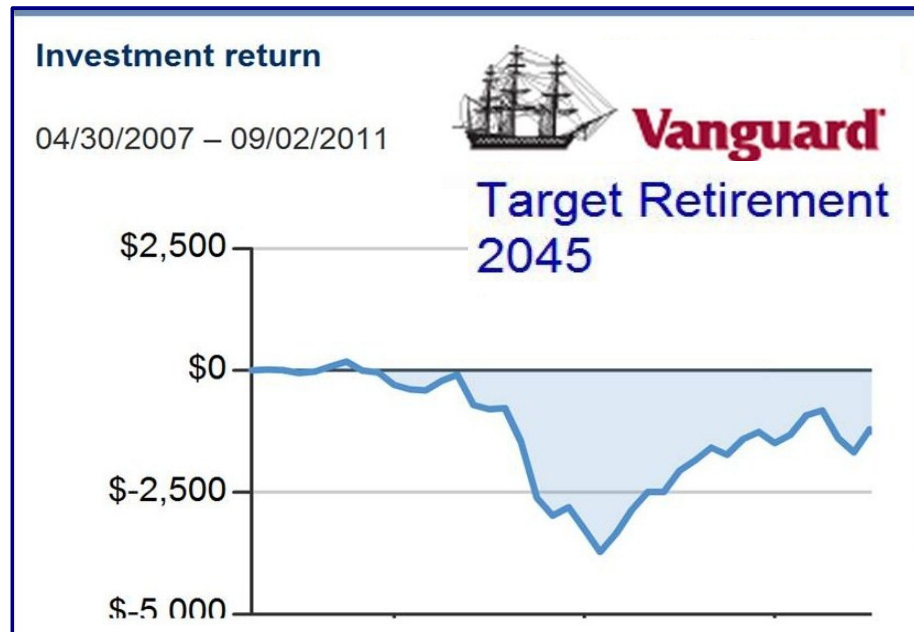
My IRA statement

Mutual Funds	Average Annual Total Returns as of 08/31/2011				
	1-Year	5-Year	10-Year	Since-Inception	
Target Retirement 2045	15.96%	1.99%	—	5.55%	10/27/2003

Motivation

My IRA statement

Mutual Funds	Average Annual Total Returns as of 08/31/2011				
	1-Year	5-Year	10-Year	Since-Inception	
Target Retirement 2045	15.96%	1.99%	—	5.55%	10/27/2003

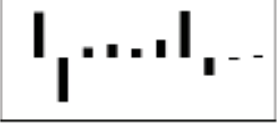


Debate

- What data to give investors, how to present it?
[Bazerman 01, Kozup Howlett Pagano 08]
[Consumer Financial Protection Bureau 11],...
- Are temporal charts of returns of use to investors?

Do return charts affect investments?

- [Hung Heinberg Yoong 10]: subjects allocate \$10,000 to funds based on past returns disclosed as **numerical table** vs. **numerical table plus chart**

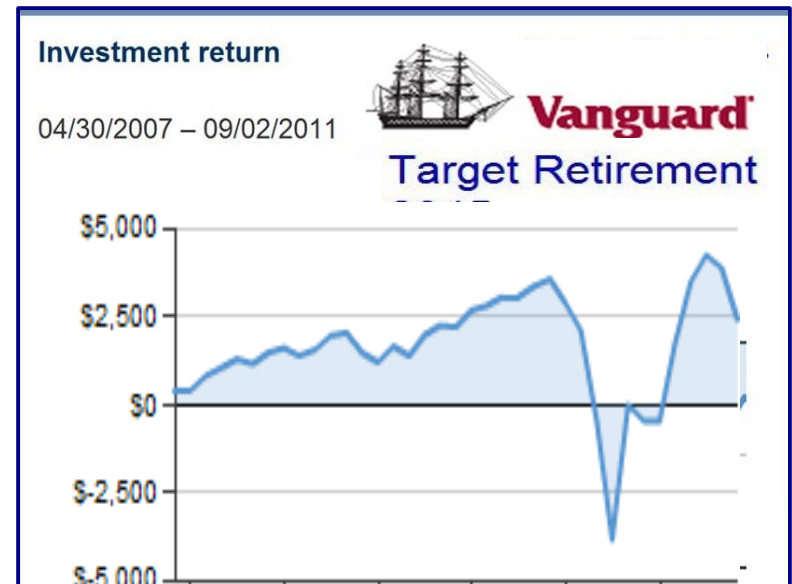
Name/ Type of Option	Graph: 2000-2009 Year-End Total Returns*	Average Annual Total Return as of 06/30/2010			
		1yr.	5yr.	10yr.	Since Inception
Stock Funds					
Small Cap Stock Index Fund A		22.7%	2.2%	3.7%	5.0% 05/21/98

- Results ambiguous: charts affect allocations, but not investment outcomes

Our Question

- What if my IRA statement has a “random” chart?

Mutual Funds	Average Annual Total Returns as of 08/31/2011				
	1-Year	5-Year	10-Year	Since-Inception	
Target Retirement 2045	15.96%	1.99%	—	5.55%	10/27/2003



- Can humans **extract information** from return charts?

Folk Myth

- Humans **cannot tell** asset **returns** from **random walk**
=> cannot extract information from return charts
- [Roberts '59, Malkiel '73, DeBondt '93,...]
- [Keogh Kasetty '03]: Which sequences are S&P 500?



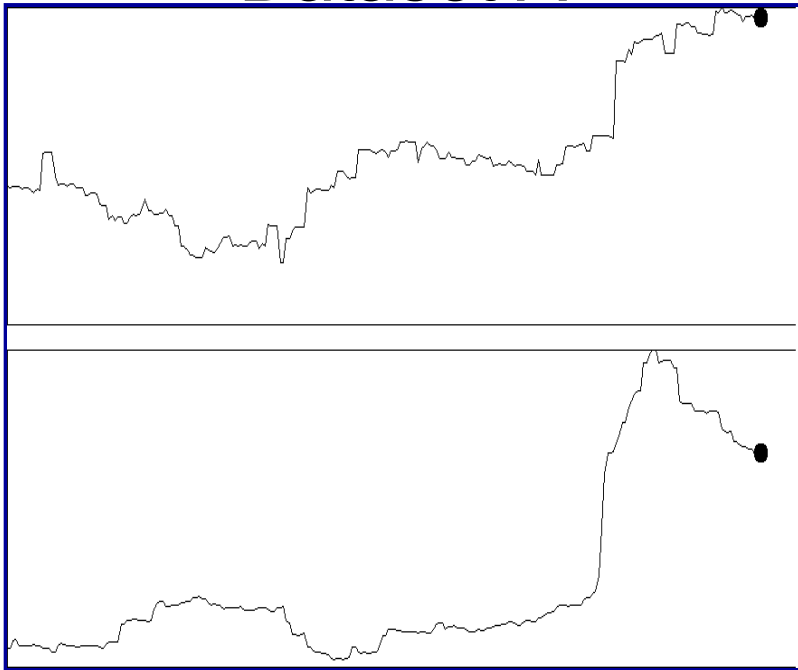
Our Work

- New, **video-game** experiment to test if humans can distinguish returns data from random
- Usefulness of video game:
Efficient collection of large amount of sound data

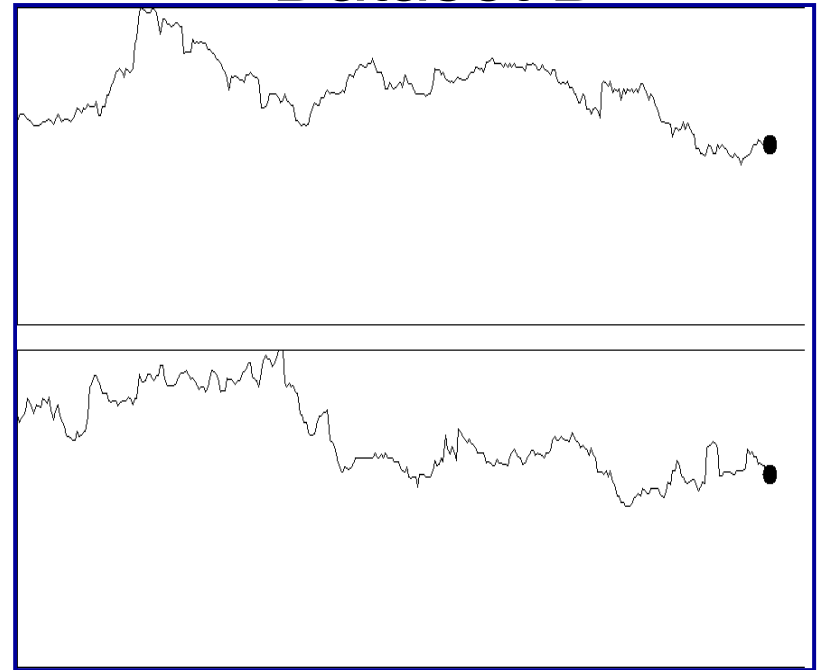
Video Game ARORA

<http://arora.ccs.neu.edu/> [H. Lo Viola '11]

Dataset A



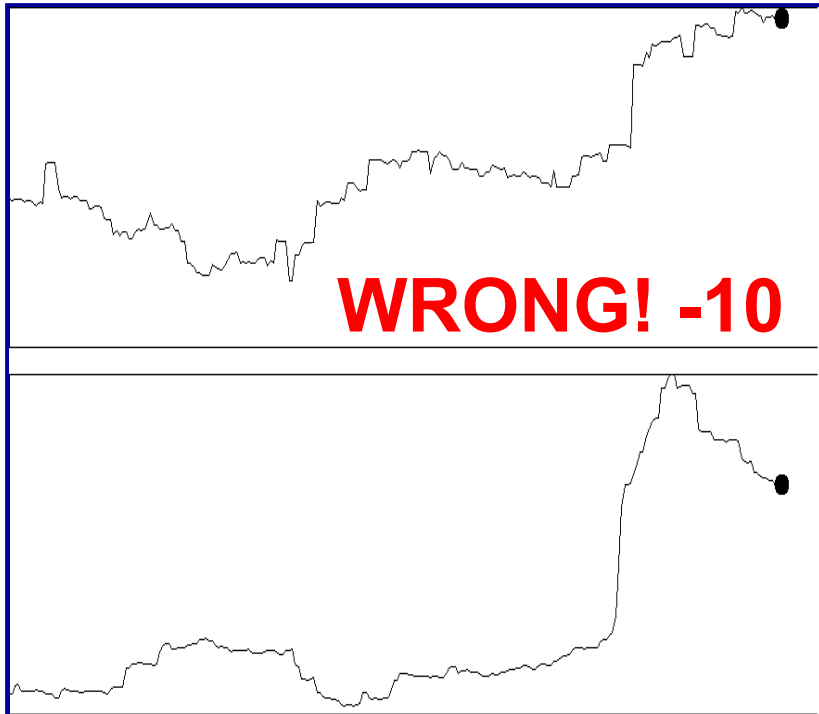
Dataset B



- Show 2 moving price charts, one real, the other random permutation of returns of real
Permutation kills temporal order, keeps mean, std,...
- Players need to click on real

Which Chart Is Real?

Dataset A



Dataset B



- Task seems easier if playing the game dynamically

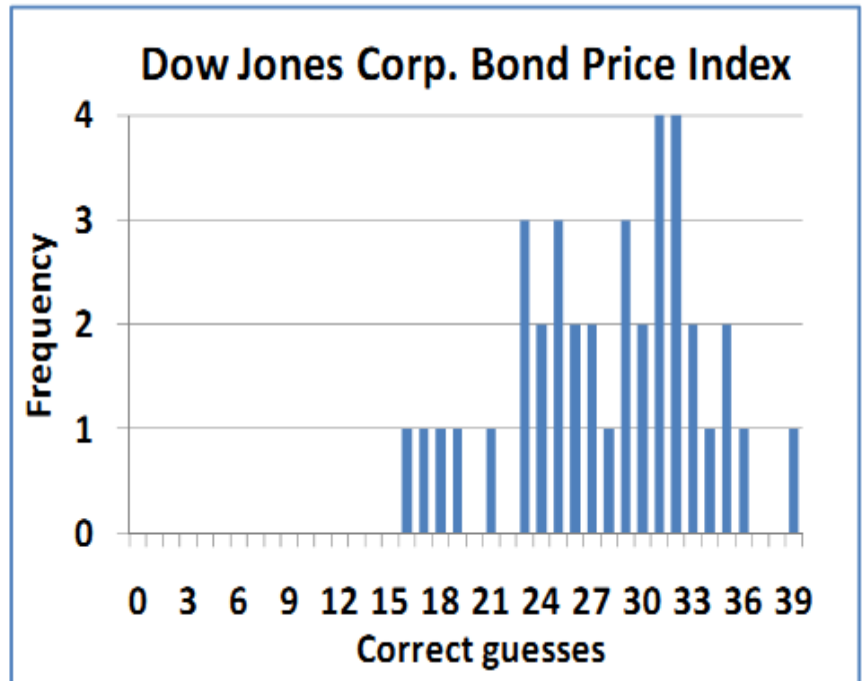
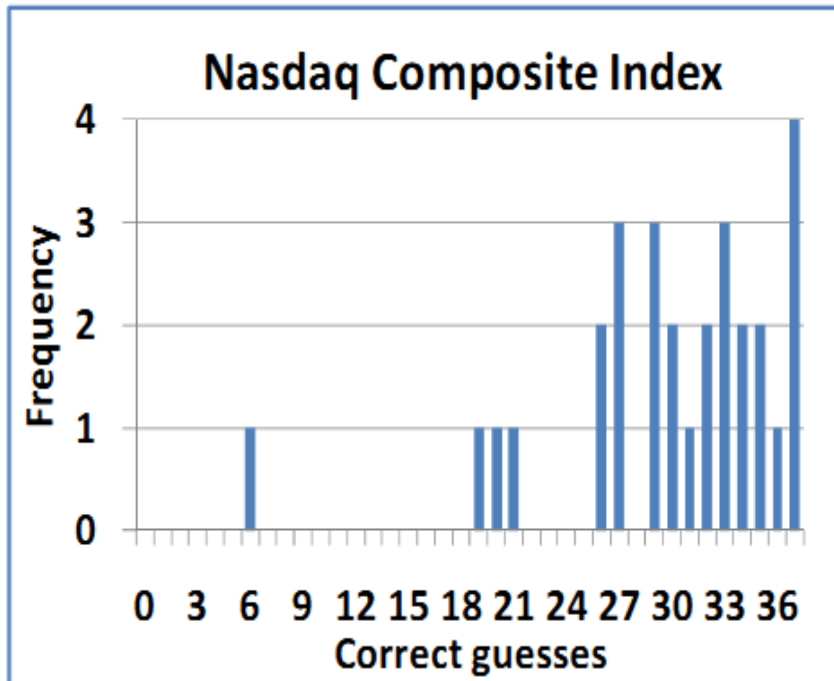
Can learn from feedback on validity of guesses

Our Experiment

- 8 contests using data:
NASDAQ, Russell 2000, USD Index, Gold Spot (tick)
DJ Corp. Bond, DJIA, CAN/USD, Corn Index (daily)
- Each contest is 31-50 charts
- 78 subjects, 8000 guesses

Our Results

- H_0 : humans cannot tell real from random charts
- Under H_0 , each guess is independent coin toss
- Strongly reject H_0 : 7 out of 8 p -values < 0.005



Biased Pool of Subjects?

Dow Jones Corporate Bond Price Index			
	Demographic group	# subjects	p-value (%)
Occup	academic/other	9	0.5
	finance	7	0.6
	student	22	0.0
Sex	female	8	2.2
	male	30	0.0
Educ	high school/undergrad	17	0.0
	MS/PhD	21	0.0
Age	>=30	14	0.0
	<30	24	0.0
Country	USA	25	0.0
	other	13	0.0
	Entire sample	38	0.0

- **Finance** background does **not help**

All datasets: 73% of guesses correct for finance experts vs. 72% for others

Future Work

- Which data properties did subjects exploit?
- Subject: “When first viewing the two data sets, it is impossible to tell which is real, but a pattern quickly emerges & the eye can easily pick out the real array”

Is feedback critical?

- Human vs. computer
Future: Video games as trading platforms



Conclusion

- Video game ARORA:
<http://arora.ccs.neu.edu/>
- Subjects can tell asset returns from their random permutation
- Our results contrast the folk myth

Thank you!