

Modes of learning and **Risk communication**

Dirk U. Wulff

University of Basel

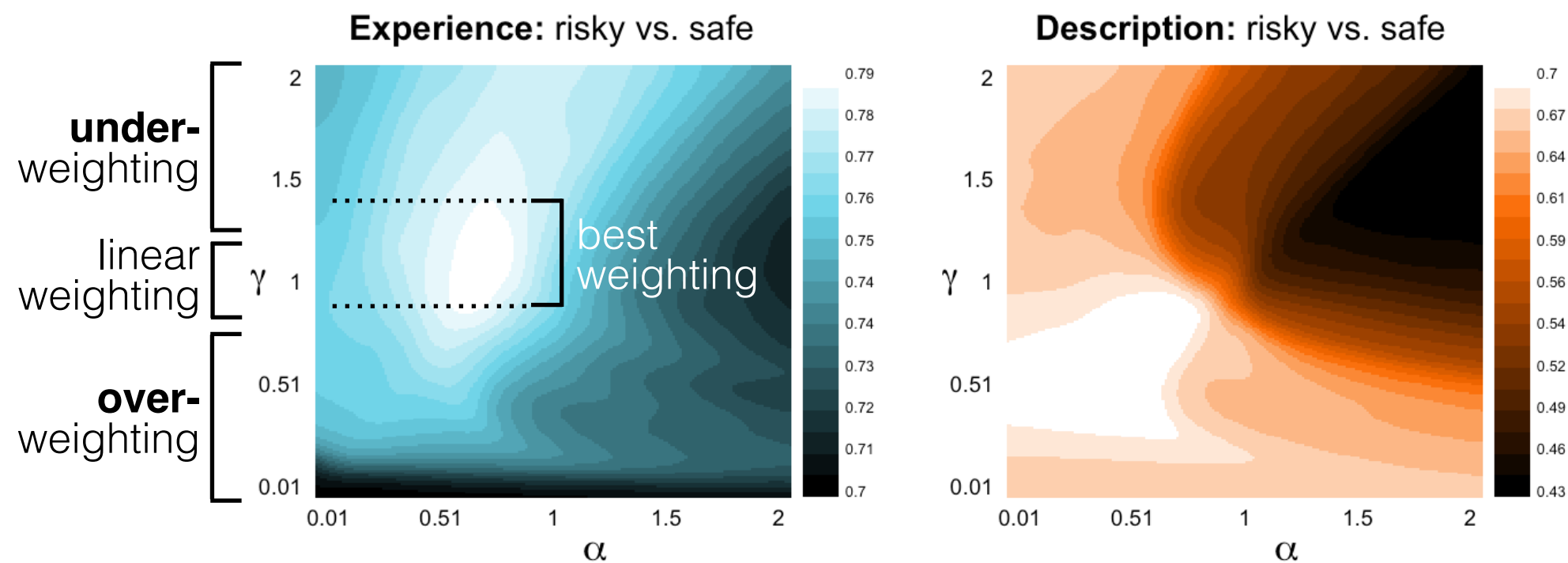
Max-Planck-Institute for Human Development

EADM summer school@ Salzburg, July 2018



Linear probability weighting

in Experience (for risky vs. safe problems)

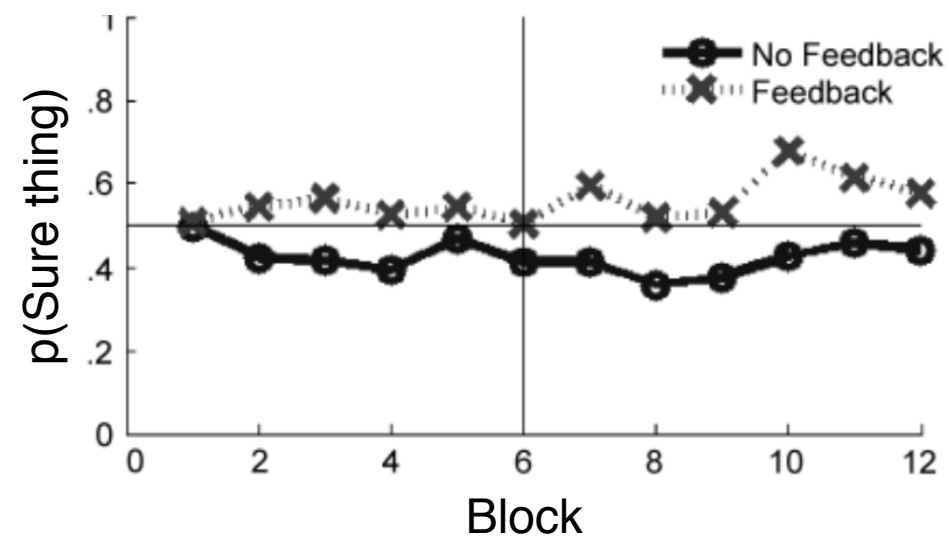


Experience 'debiases'

...description-based choices

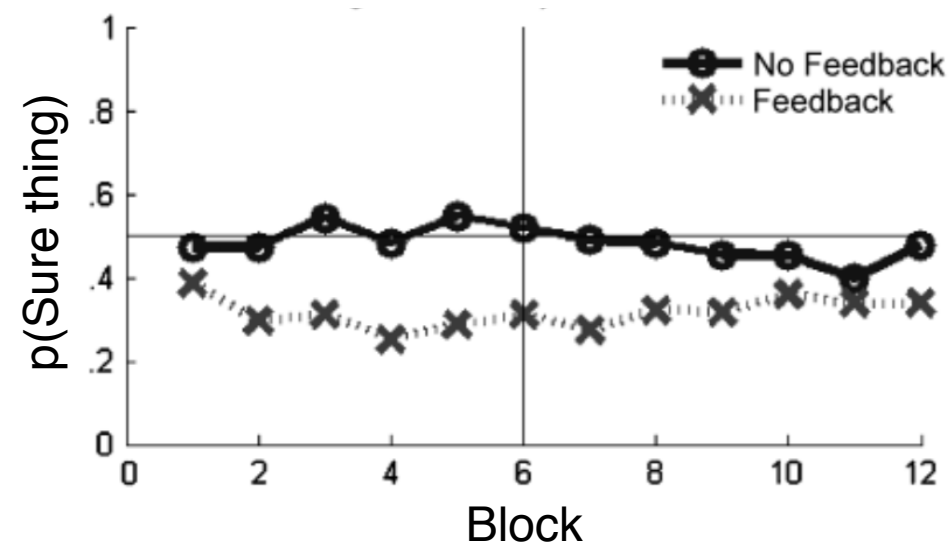
A \$3 for sure

B \$4 with .8

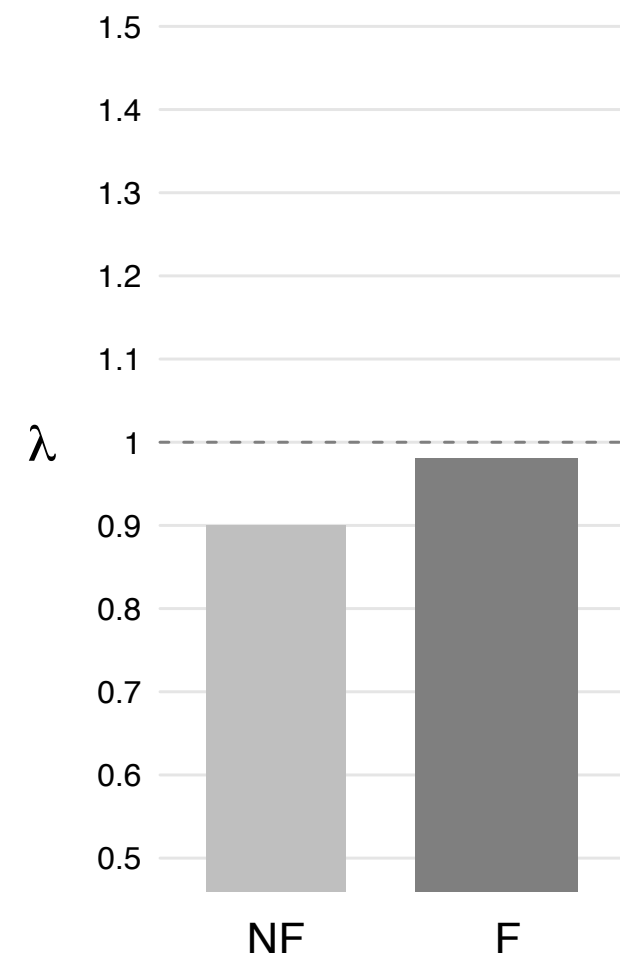


A \$3 for sure

B \$64 with .05



$$w = e^{-(-\log(p))^{\gamma}}$$



Experience triggers more accurate probability judgments than description

‘How many days do you estimate that it will rain in a ten-day period in each of the four cities?’

		Kent	Talbot	Somerset	Harford
Objective probability		0.30	0.90	0.60	0.10
Mean observed probability	Description				
	Experience				
	SD				
Mean frequency judgments	Description				
	SD				
	Experience				
	SD				
p -value for different means					
p -value for different variances					

The Role of Experience Sampling and Graphical Displays on One's Investment Risk Appetite

Christine Kaufmann

Lehrstuhl für Bankbetriebslehre, Universität Mannheim, 68131 Mannheim, Germany,
kaufmann@bank.bwl.uni-mannheim.de

Martin Weber

Lehrstuhl für Bankbetriebslehre, Universität Mannheim, 68131 Germany; and Centre for Economic Policy Research,
London EC1V 3PZ, United Kingdom, weber@bank.bwl.uni-mannheim.de

Emily Haisley

Barclays PLC, London E14 5HP, United Kingdom, emily.haisley@barclays.com

Financial professionals have a great deal of discretion concerning how to relay information about the risk of financial products to their clients. This paper introduces a new risk tool to communicate the risk of investment products, and it examines how different risk-presentation modes influence risk-taking behavior and investors' recall ability of the risk-return profile of financial products. We analyze four different ways of communicating risk: (i) numerical descriptions, (ii) experience sampling, (iii) graphical displays, and (iv) a combination of these formats in the "risk tool." Participants receive information about a risky and a risk-free fund and make an allocation between the two in an experimental investment portfolio. We find that risky allocations are elevated in both the risk tool and experience sampling conditions. Greater risky allocations in the risk tool condition are associated with decreased risk perception, increased confidence in the risky fund, and a lower estimation of the probability of a loss. In addition to these favorable perceptions of the risky fund, participants in the risk tool condition are more accurate on recall questions regarding the expected return and the probability of a loss. We find no evidence of greater dissatisfaction with returns in these conditions, and we observe a willingness to take on similar levels of risk in subsequent allocations.

Key words: risk taking; asset allocation; risk perception; experience-description gap; presentation format
History: Received July 15, 2010; accepted June 11, 2012, by Teck Ho, behavioral economics. Published online in *Articles in Advance* December 10, 2012.



Communicating forecasts: The simplicity of simulated experience

Robin M. Hogarth^{a,*}, Emre Soyer^b^a Universitat Pompeu Fabra, Department of Economics & Business, Barcelona, Spain^b Ozyegin University, Faculty of Business, Istanbul, Turkey

ARTICLE INFO

Article history:

Received 1 January 2014

Received in revised form 1 February 2015

Accepted 1 February 2015

Available online 4 April 2015

Keywords:

Communication of forecasts

Simulation

Experience

Predictive judgments

Probabilistic inference

Decision making

ABSTRACT

It is unclear whether decision makers who receive forecasts expressed as probability distributions over outcomes understand the implications of this form of communication. We suggest a solution based on the fact that people are effective at estimating the frequency of data accurately in environments that are characterized by plentiful, unbiased feedback. Thus, forecasters should provide decision makers with simulation models that allow them to experience the frequencies of potential outcomes. Before implementing this suggestion, however, it is important to assess whether people can make appropriate probabilistic inferences based on such simulated experience. In an experimental program, we find that statistically sophisticated and naïve individuals relate easily to this presentation mode, they prefer it to analytic descriptions, and their probabilistic inferences improve. We conclude that asking decision makers to use simulations actively is potentially a powerful – and simplifying – method to improve the practice of forecasting.

© 2015 Elsevier Inc. All rights reserved.

Review of Finance (2015) 19: pp. 1019–1052

doi:10.1093/rof/rfu021

Advance Access publication: June 6, 2014

Improving Investment Decisions with Simulated Experience*

MEIKE A. S. BRADBURY¹, THORSTEN HENS^{1,2} and
STEFAN ZEISBERGER¹¹University of Zurich; ²Norwegian School of Economics

Abstract. We apply a new and innovative approach to communicating risks associated with financial products that should support investors in making better investment decisions. In our experiments, participants are able to gain "simulated experience" by random sampling of a previously described return distribution. We find that simulated experience considerably improves participants' understanding of the underlying risk–return profile and prompts them to reconsider their investment decisions and to choose riskier financial products without regretting their higher risk-taking behavior afterwards. This method of experienced-based learning has high potential for being integrated into real-world applications and services.

ORIGINAL ARTICLE

Experienced Probabilities Increase Understanding of Diagnostic Test Results in Younger and Older Adults

Bonnie Armstrong, MA, Julia Spaniol, PhD

Background. With advancing age, the frequency of medical screening increases. Interpreting the results of medical tests involves estimation of posterior probabilities such as positive predictive values (PPVs) and negative predictive values (NPVs). Both laypeople and experts are typically poor at estimating posterior probabilities when the relevant statistics are communicated descriptively. The current study examined whether an experience format would improve posterior probability judgments in younger and older adults, relative to a description format. **Method.** Eighty younger (ages 17–34 y) and 80 older adults (ages 65–87 y) completed an experimental task in which information about medical screening tests for 2 fictitious diseases was presented either through description or experience. Participants in the descriptive format read a passage containing statistical information, whereas participants in the experience format viewed a

slideshow of representative cases that illustrated the relative frequency of the disease as well as the relative frequency of positive and negative test results. **Results.** Both younger and older adults made more accurate posterior probability estimates in the experience format, relative to the description format. In the descriptive format, PPVs were overestimated and NPVs were underestimated. Regardless of format type, participants reported that they would prefer to rely on a physician to make medical decisions on their behalf compared with themselves. **Discussion.** These findings are indicative of a description-experience gap in Bayesian inference, and they suggest possible avenues for enhancing medical risk communication for both younger and older patients. **Key words:** description-experience gap; Bayesian inference; medical screening tests; older adults; numeracy; risk communication. (*Med Decis Making* 2017;37:670–679)

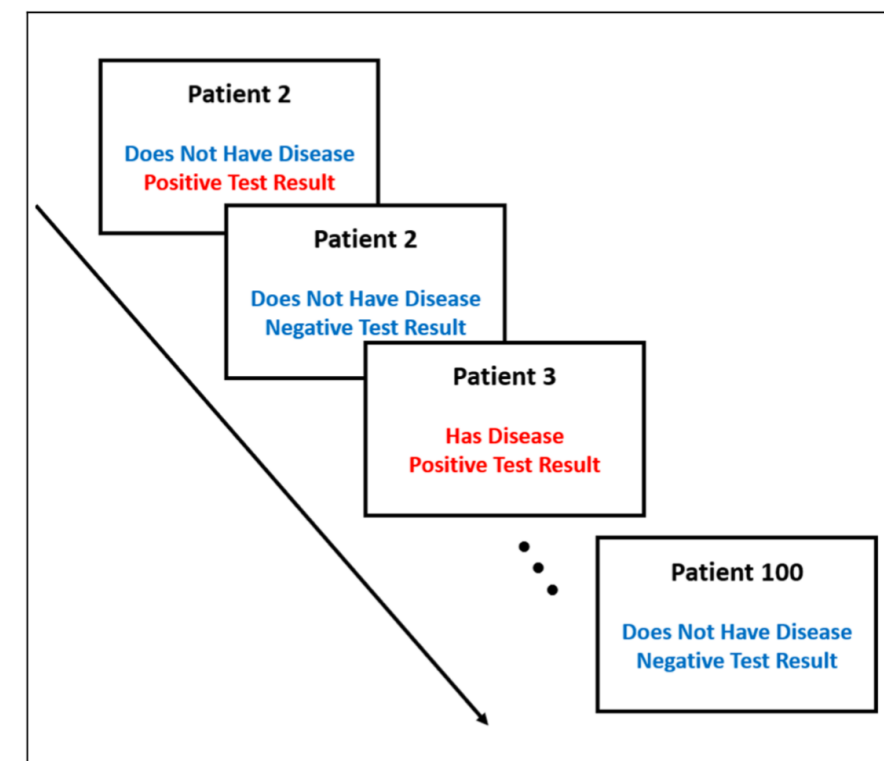
Positive impact of experience for understanding medical test results

Armstrong & Spaniol (2017)

Description

	Polykronisia	Zymbosis
Disease prevalence (%)	2.00	1.00
Test properties (%)		
Sensitivity	100.00	100.00
Specificity	91.84	89
False-alarm rate	8.16	11.11
PPV	20.00	8.33
NPV	100.00	100.00
Frequency (experience format)		
Disease/positive test	2	1
Disease/negative test	0	0
No disease/positive test	8	11
No disease/negative test	90	88

Experience



Positive impact of experience for understanding medical test results

Armstrong & Spaniol (2017)

	Description		Experience	
	Younger	Older	Younger	Older
PPV error				
Polykronesia	58.30 (29.01)	51.67 (31.42)	19.15 (26.53)	7.78 (18.07)
Zymbosis	64.53 (37.77)	57.93 (39.51)	10.81 (21.22)	9.29 (19.64)
NPV error				
Polykronesia	26.03 (39.03)	26.03 (39.03)	5.51 (16.15)	8.45 (18.48)
Zymbosis	15.83 (29.18)	27.97 (39.13)	2.84 (4.92)	8.39 (16.70)
Self-assessment				
Confidence	2.75 (1.03)	2.87 (1.20)	3.43 (0.93)	3.28 (1.28)
Difficulty	3.75 (0.87)	3.75 (0.81)	3.05 (1.01)	3.10 (1.11)
Belief in accuracy	3.20 (0.85)	3.20 (0.82)	3.55 (1.06)	3.50 (0.78)
Self v. physician	6.45 (2.72)	6.63 (2.68)	6.38 (2.39)	5.75 (2.44)

Asset allocation

Kaufmann, Weber, & Haisley (2013)

Fund A is a risk-free asset. It has a guaranteed annual return of **3.35% for sure**. If you invest the full \$100 in Fund A, you will have a return of \$118 in five years, net of fees.

Fund B is a risky asset. It has an expected annual return of **8.92% with an annual standard deviation of 15.89%**. If you invest the full \$100 in that asset, you will have an expected final outcome of \$153 in five years. However, the actual return is not known. It could be higher or lower. In 70 out of 100 cases your final wealth will be between \$100 and \$208 and in 95 out of 100 cases between \$72 and \$289.

Amount to invest in Fund A **30**

Amount to invest in Fund B **70**

Fund A



Fund B

Based on your allocation, your expected return in 5 years is: \$136

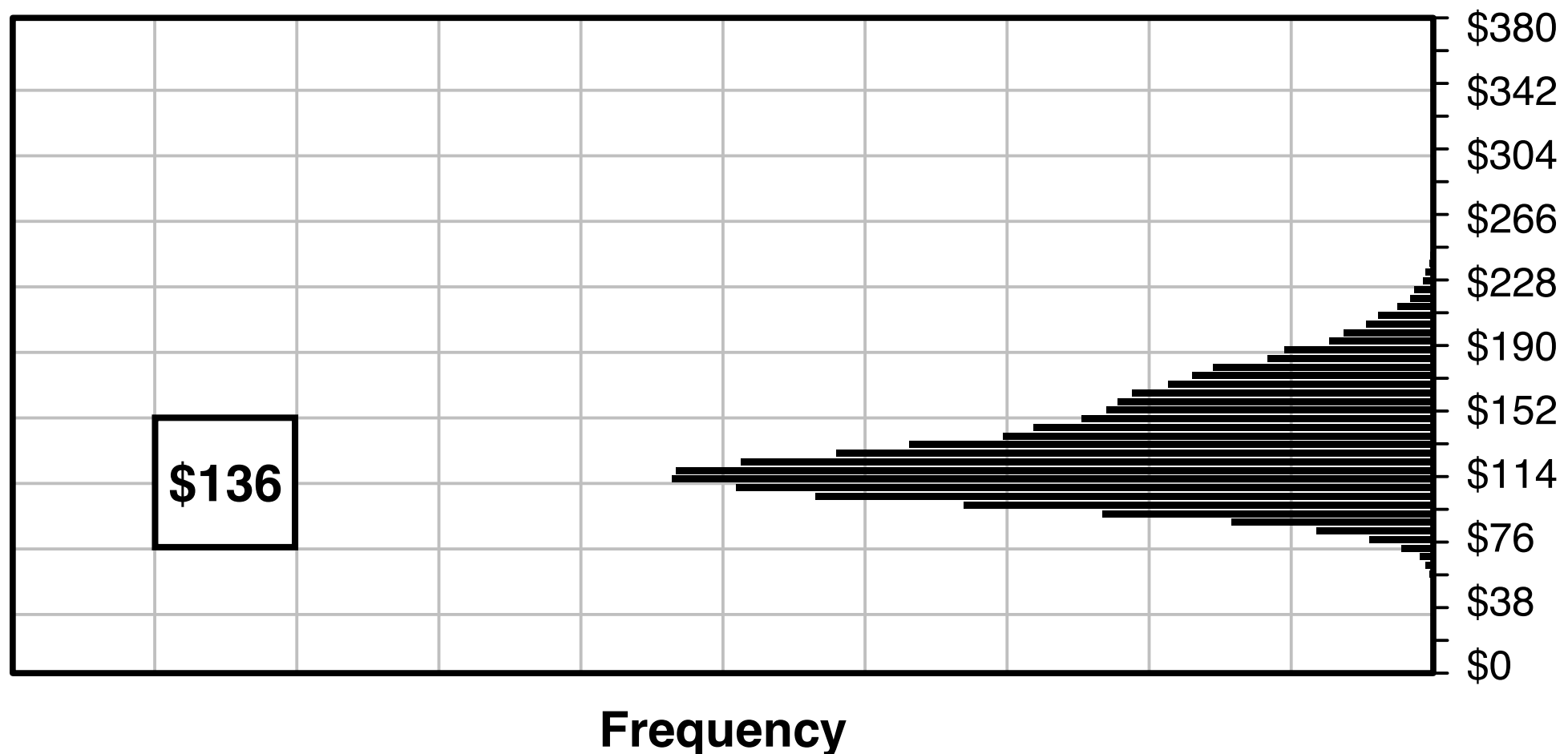
In 70 out of 100 cases your return will be between \$109 and \$163.

In 95 out of 100 cases your return will be between \$95 and \$203.

**Final
decision**

Asset allocation

Kaufmann, Weber, & Haisley (2013)



Start simulation

☒ Fast mode

Show final result

Change allocation

Final decision

Interactive element

Experience Risk tool(s)

Task: Read instructions on screen. Play each task multiple times.

Is experience always better?

The Weight of Experience

Each time you hit the (Left/Right) button there is a 1 in 1000 chance (.001 probability) that you will lose \$15

A
\$0.1
for sure

B
\$0.13 w/ 99.9%
or
\$-15 w/ 0.1%

Early

Warning

Repeated Choice

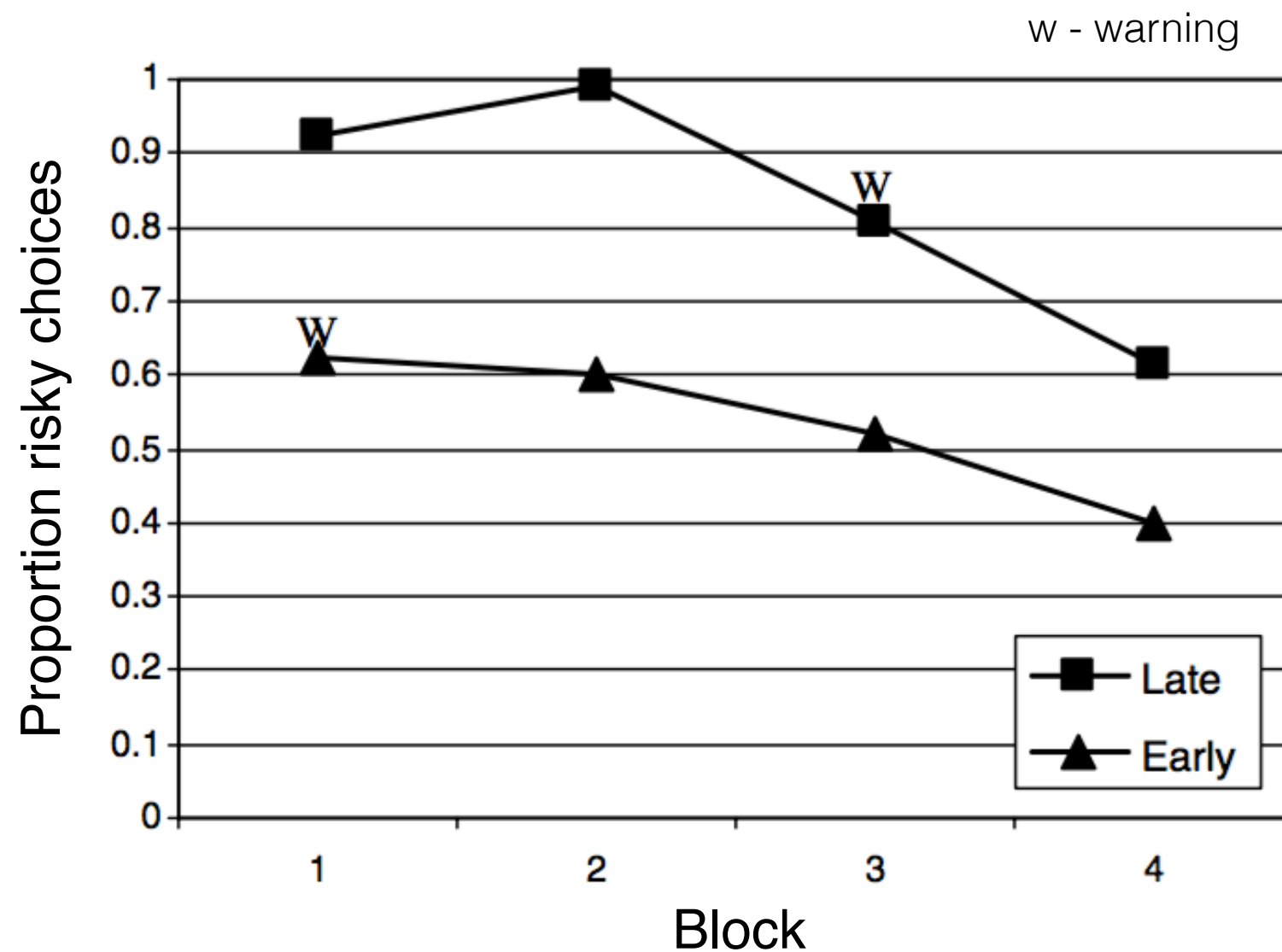
Late

Repeated Choice

Warning

Repeated Choice

The Weight of Experience



The Weight of Experience

“A crisis could start today. The trouble is that nobody would be able to tell how long it would last, what type of eruption it would be, or how the event would evolve”

“There would be no modern precedent for an evacuation of this magnitude. This is why the Vesuvius is the most dangerous volcano of the world.”

Giuseppe Mastrolorenzo,
Vesuvius Volcano Observatory
(Nature, 2011)



Vesuvius

Naples

4 epistemic states

Experience - Description -

Experience + Description -

Experience - Description +

Experience + Description +

Conclusions

- I Modes of learning shape risk perception and behavior
- II Experience weighs heavier than description.
- III Experience may foster a better understanding of probabilities
- IV Good risk communication likely requires both formats.



Ralph Hertwig

