人工智慧投資分析

AI for Investment Analysis

投資心理學與行為財務學

(Investing Psychology and Behavioral Finance)

1082AIIA04

MBA, IMTKU (M2399) (8409) (Spring 2020)

Wed 3, 4 (10:10-12:00) (B206)

Min-Yuh Day

戴敏育

Associate Professor

副教授

Dept. of Information Management, Tamkang University

淡江大學 資訊管理學系

http://mail. tku.edu.tw/myday/

2020-03-25

課程大綱 (Syllabus)

週次 (Week)	日期 (Date)	內容 (Subject/Topics)
1	2020/03/04	人工智慧投資分析課程介紹 (Course Orientation on AI for Investment Analysis)
2	2020/03/11	AI 金融科技: 金融服務創新應用 (AI in FinTech: Financial Services Innovation and Application)
3	2020/03/18	機器人理財顧問與AI交談機器人 (Robo-Advisors and AI Chatbots)
4	2020/03/25	投資心理學與行為財務學 (Investing Psychology and Behavioral Finance)
5	2020/04/01	財務金融事件研究法 (Event Studies in Finance)
6	2020/04/08	人工智慧投資分析個案研究 I (Case Study on AI for Investment Analysis I)

課程大綱 (Syllabus)

週次 (Week)	日期 (Date)	內容 (Subject/Topics)
7	2020/04/15	Python AI投資分析基礎 (Foundations of AI Investment Analysis in Python)
8	2020/04/22	Python Pandas 量化投資分析 (Quantitative Investing with Pandas in Python)
9	2020/04/29	期中報告 (Midterm Project Report)
10	2020/05/06	Python Scikit-Learn 機器學習投資分析 (Machine Learning for Investment Analysis with Scikit-Learn In Python)
11	2020/05/13	TensorFlow 深度學習投資分析 I (Deep Learning for Investment Analysis with TensorFlow I)
12	2020/05/20	TensorFlow 深度學習投資分析 II (Deep Learning for Investment Analysis with TensorFlow II)

課程大綱 (Syllabus)

週次 (Week)	日期 (Date)	內容 (Subject/Topics)
13	2020/05/27	人工智慧投資分析個案研究 II (Case Study on Artificial Intelligence for Investment Analysis II)
14	2020/06/03	TensorFlow 深度學習投資分析 III (Deep Learning for Investment Analysis with TensorFlow III)
15	2020/06/10	投資組合最佳化與程式交易 (Portfolio Optimization and Algorithmic Trading)
16	2020/06/17	期末報告 I (Final Project Presentation I)
17	2020/06/24	期末報告 II (Final Project Presentation II)
18	2020/07/01	教師彈性補充教學

Investing Psychology and Behavioral Finance

Investor Sentiment

CNN Money

CNN Money

Fear & Greed Index

What emotion is driving the market now?

Previous Close	Neutral	49
1 Week Ago	Greed	64
1 Month Ago	Greed	71
1 Year Ago	Extreme Greed	89

Last updated Oct 2 at 6:30pm

Source: https://money.cnn.com/data/fear-and-greed/

Consumer Psychology and Behavior

How consumers think, feel, and act

Source: Philip Kotler & Kevin Lane Keller, Marketing Management, 14th ed., Pearson, 2012

Fintech: Technology Innovation in Financial Services

Fintech Impact on Consumer Behavior

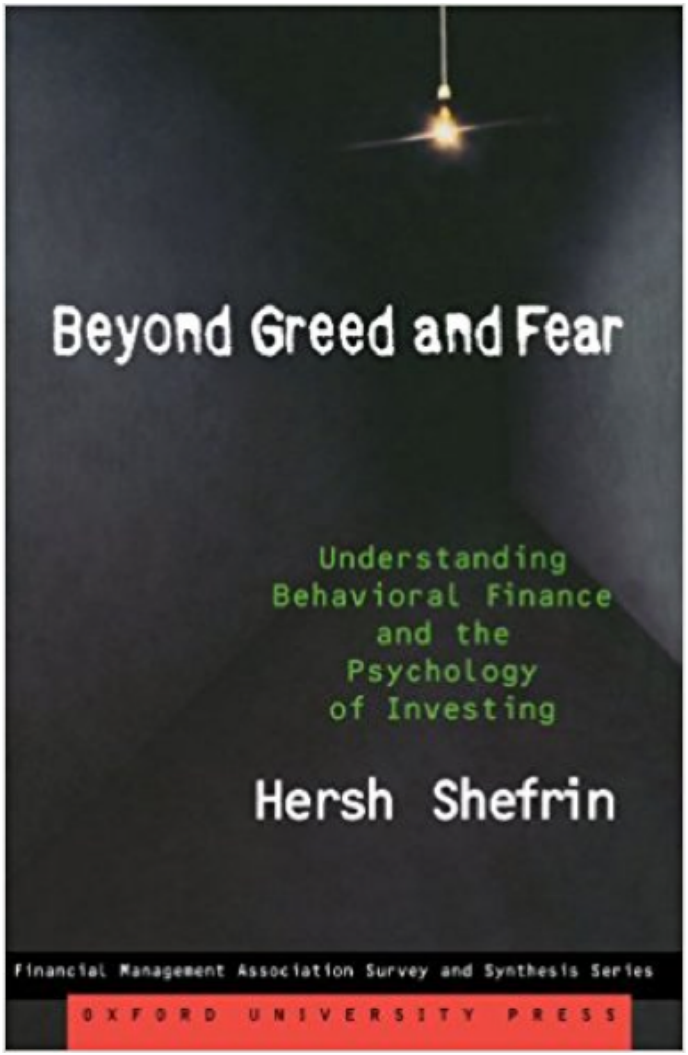
Source: http://bitcoinist.com/fintech-impact-consumer-behavior-mobile-payments/

Behavioral Finance

Hersh Shefrin (2007),

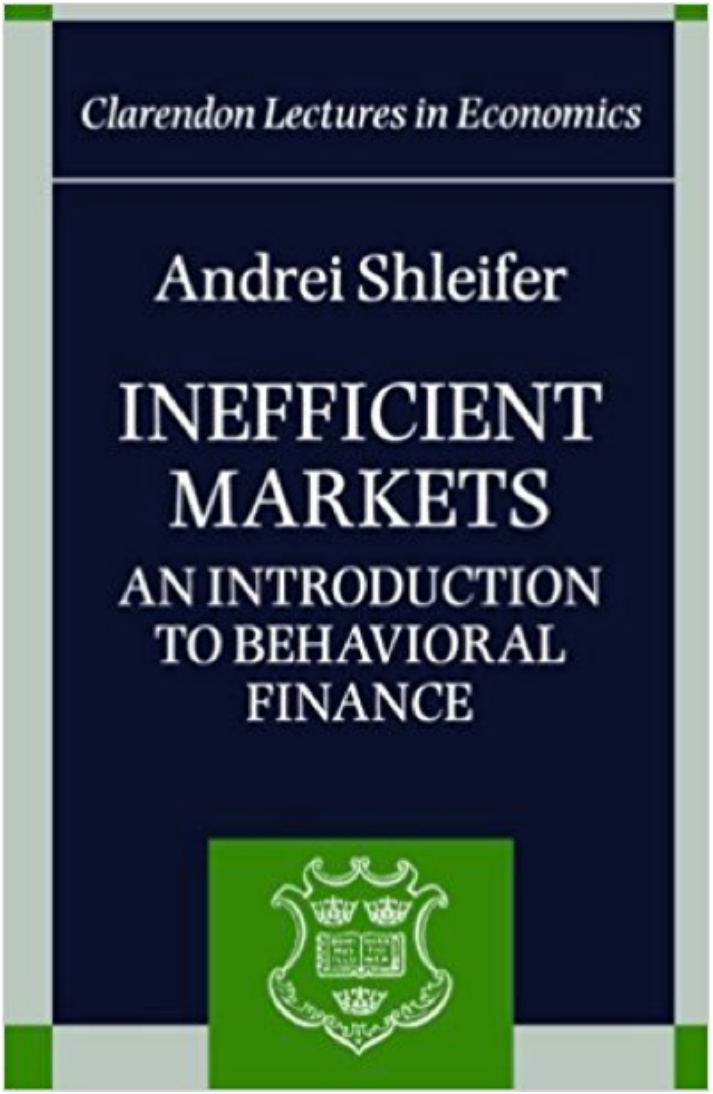
Beyond Greed and Fear:

Understanding Behavioral Finance and the Psychology of Investing, Oxford University Press



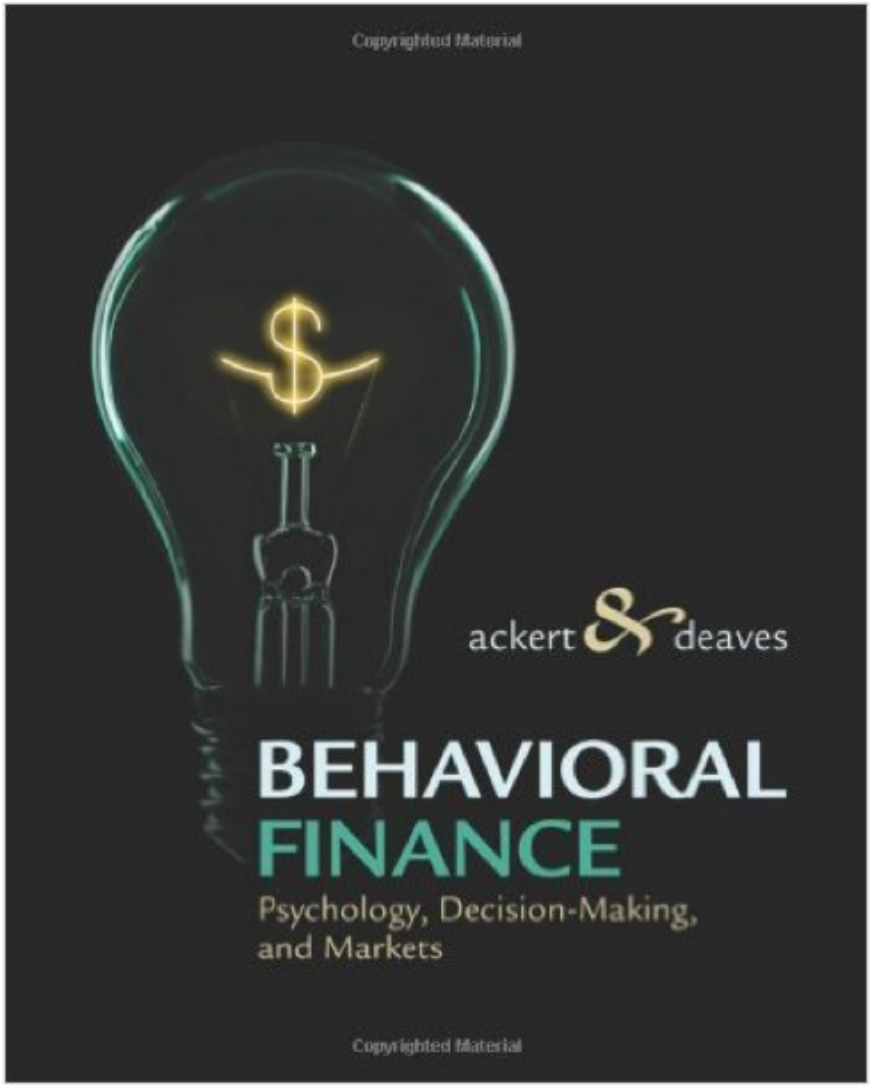
Source: https://www.amazon.com/Beyond-Greed-Fear-Understanding-Association/dp/0195304217

Andrei Shleifer (2000), Inefficient Markets: An Introduction to Behavioral Finance, Oxford University Press



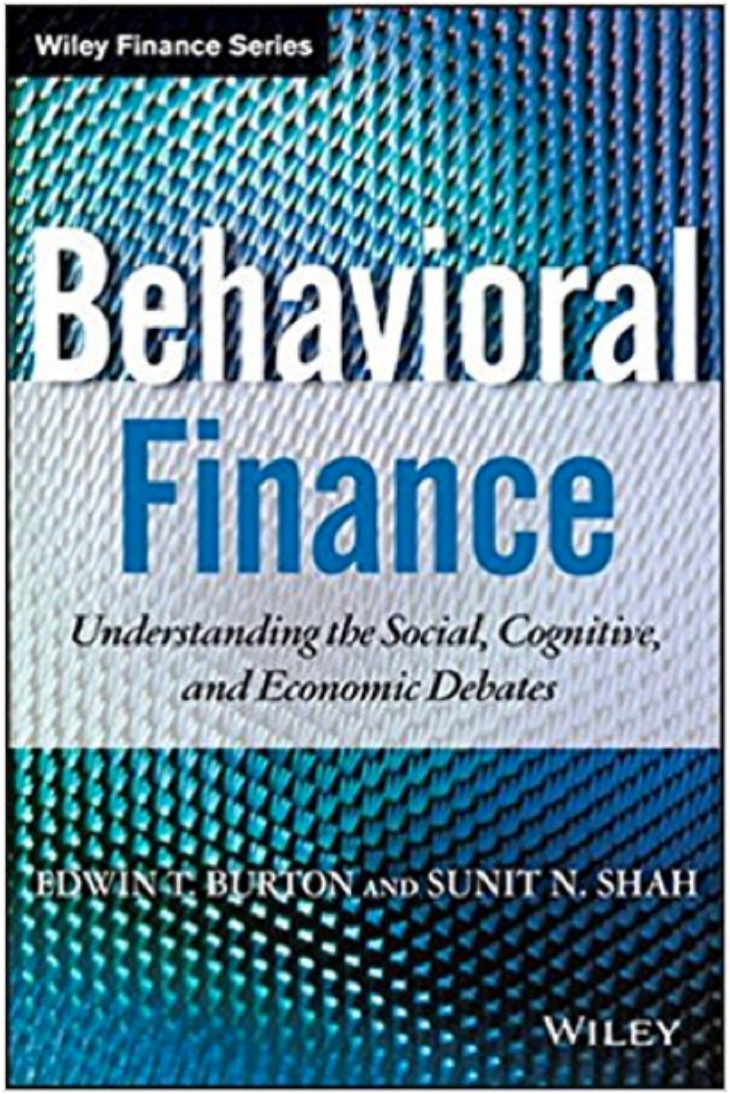
Source: https://www.amazon.com/Inefficient-Markets-Introduction-Behavioral-Clarendon/dp/0198292279

Lucy Ackert and Richard Deaves (2009), Behavioral Finance: Psychology, Decision-Making, and Markets, South-Western College Pub



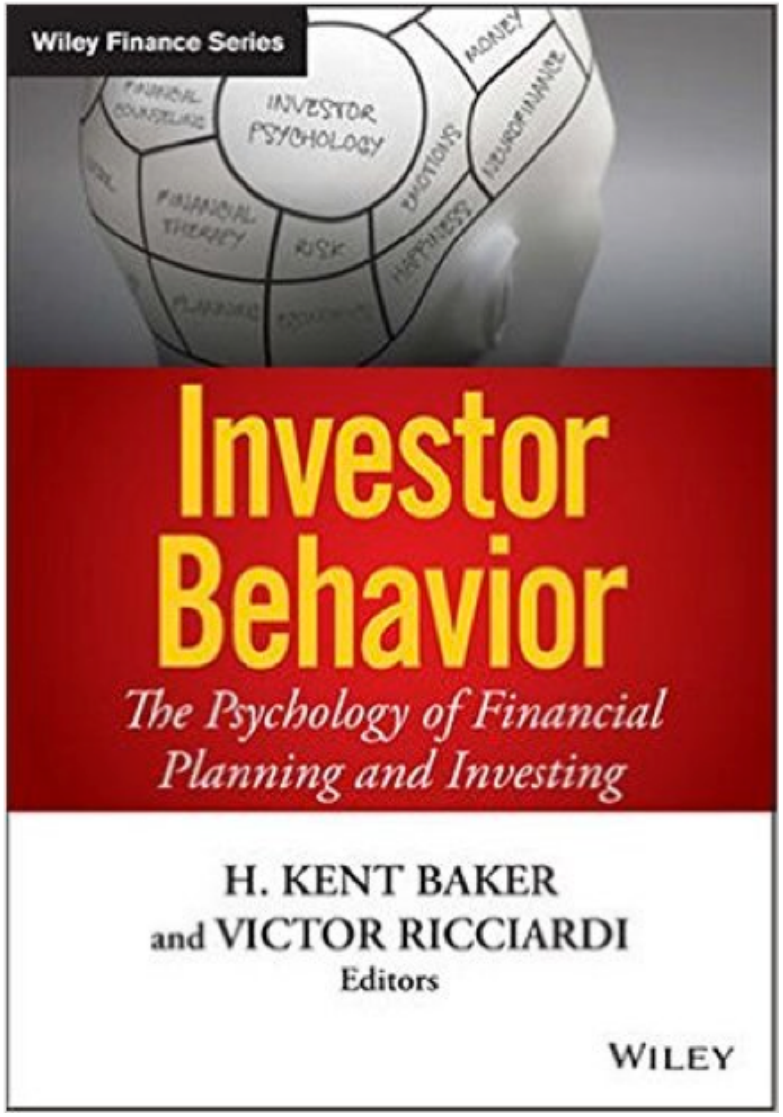
Source: https://www.amazon.com/Behavioral-Finance-Psychology-Decision-Making-Markets/dp/0324661177

Edwin Burton and Sunit N. Shah (2013) Behavioral Finance: Understanding the Social, Cognitive, and Economic Debates, Wiley



Source: https://www.amazon.com/Behavioral-Finance-Understanding-Cognitive-Economic/dp/111830019X

H. Kent Baker and Victor Ricciardi (2014) Investor Behavior: The Psychology of Financial Planning and Investing, Wiley



Source: https://www.amazon.com/Investor-Behavior-Psychology-Financial-Investing/dp/1118492986

Marketing

“Meeting needs profitably”

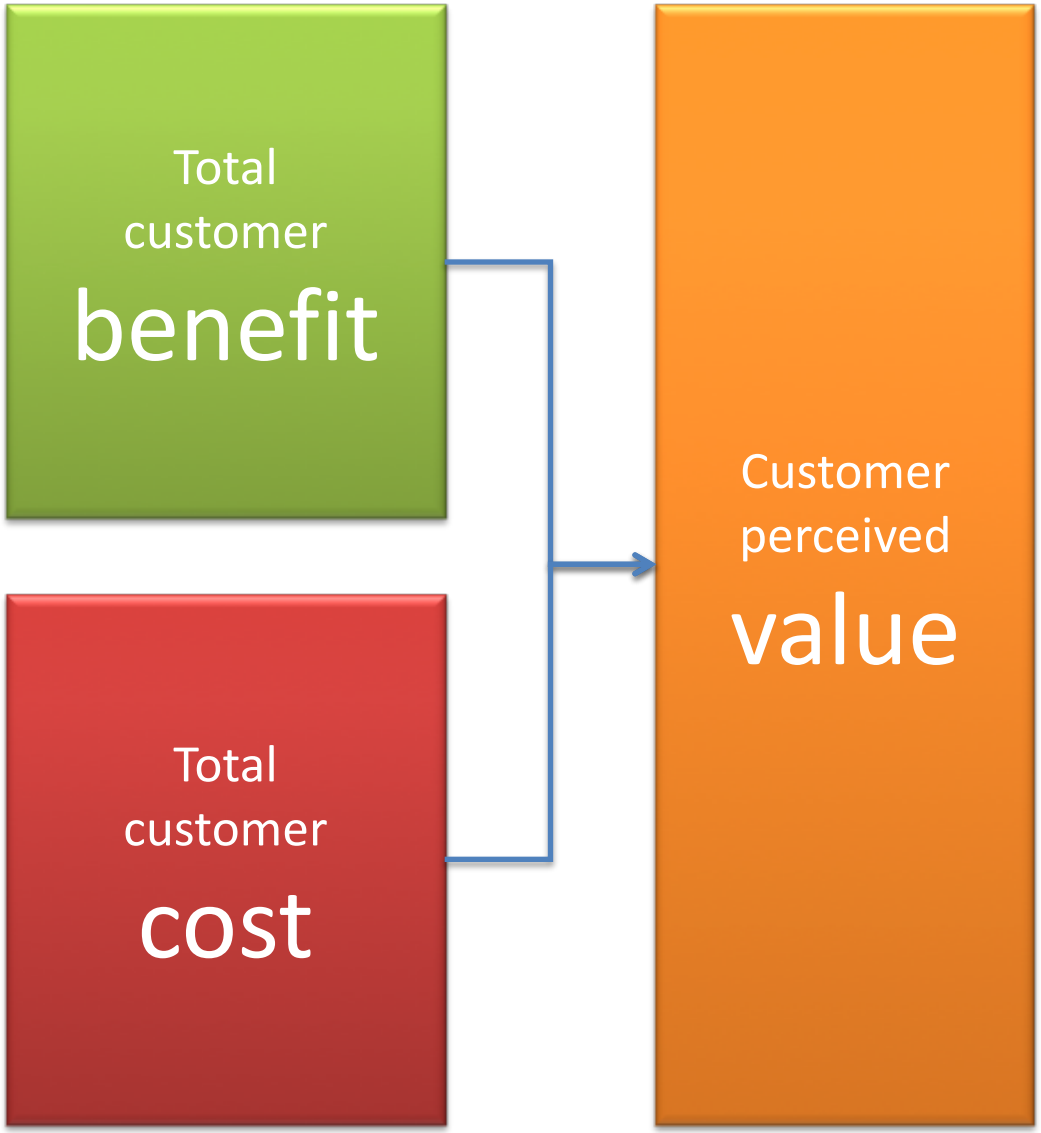
Source: Philip Kotler & Kevin Lane Keller, Marketing Management, 14th ed., Pearson, 2012

Value

the sum of the tangible and intangible benefits and costs

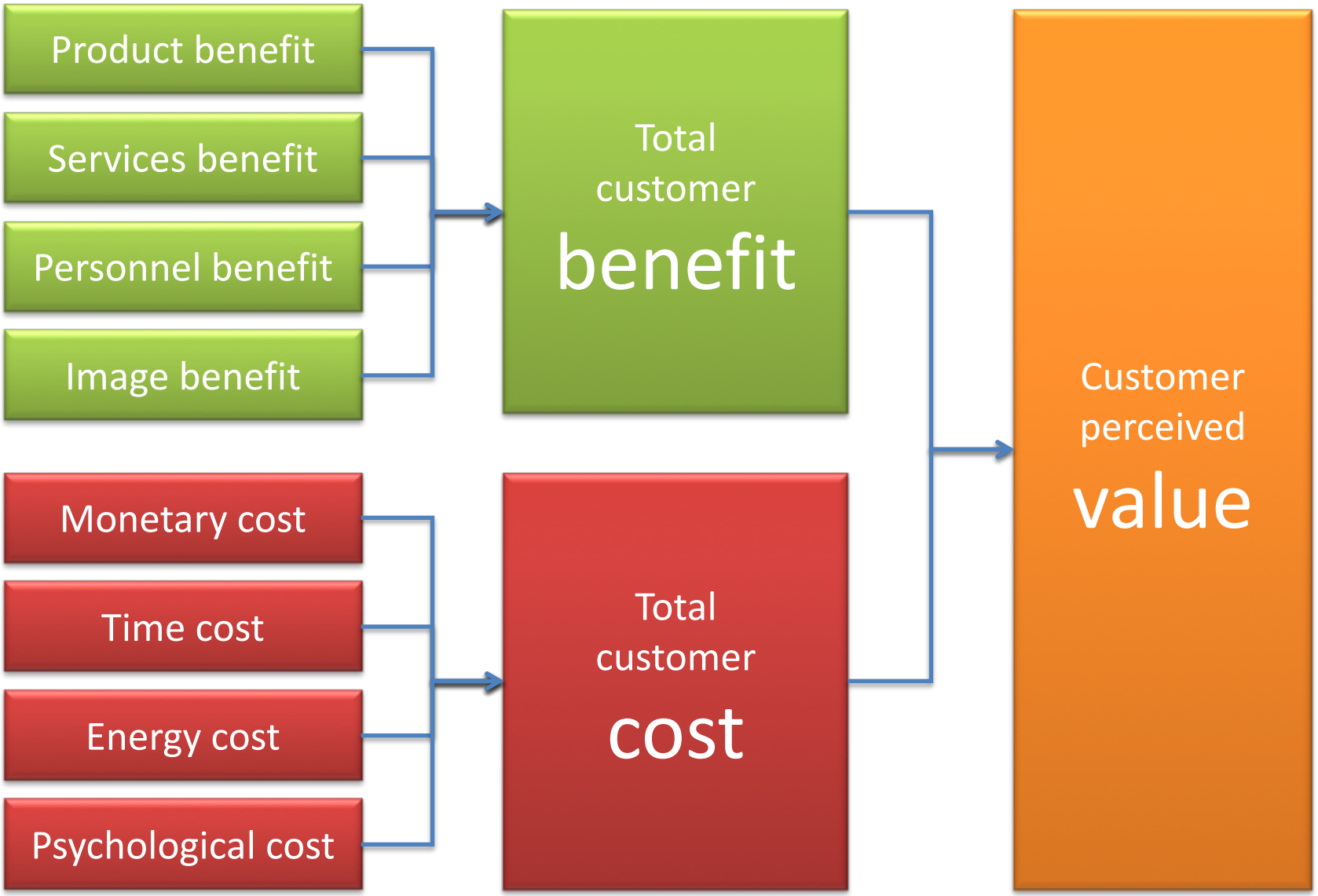
Source: Philip Kotler & Kevin Lane Keller, Marketing Management, 14th ed., Pearson, 2012

Value



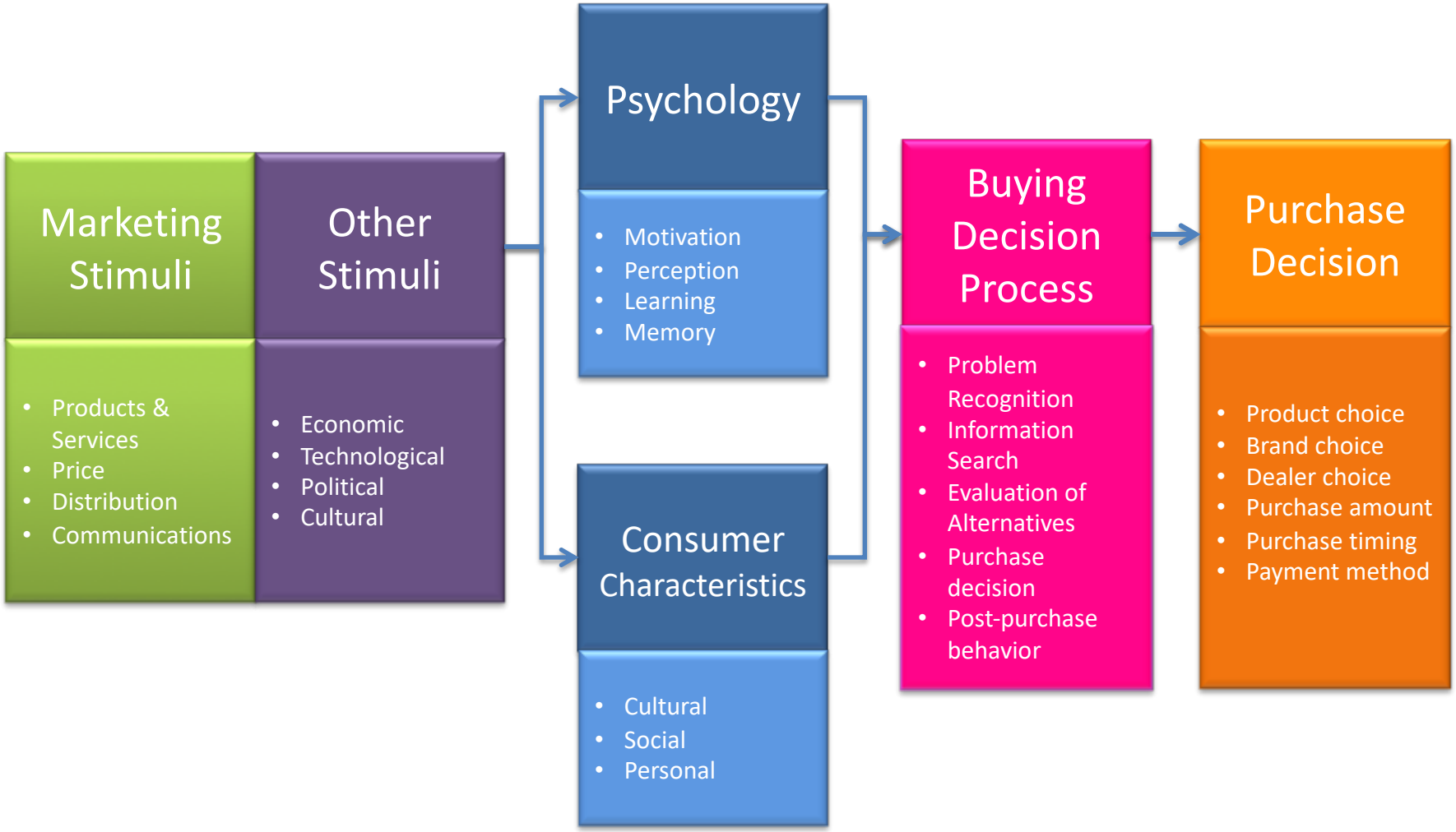
Source: Philip Kotler & Kevin Lane Keller, Marketing Management, 14th ed., Pearson, 2012

Customer Perceived Value



Source: Philip Kotler & Kevin Lane Keller, Marketing Management, 14th ed., Pearson, 2012

Model of Consumer Behavior

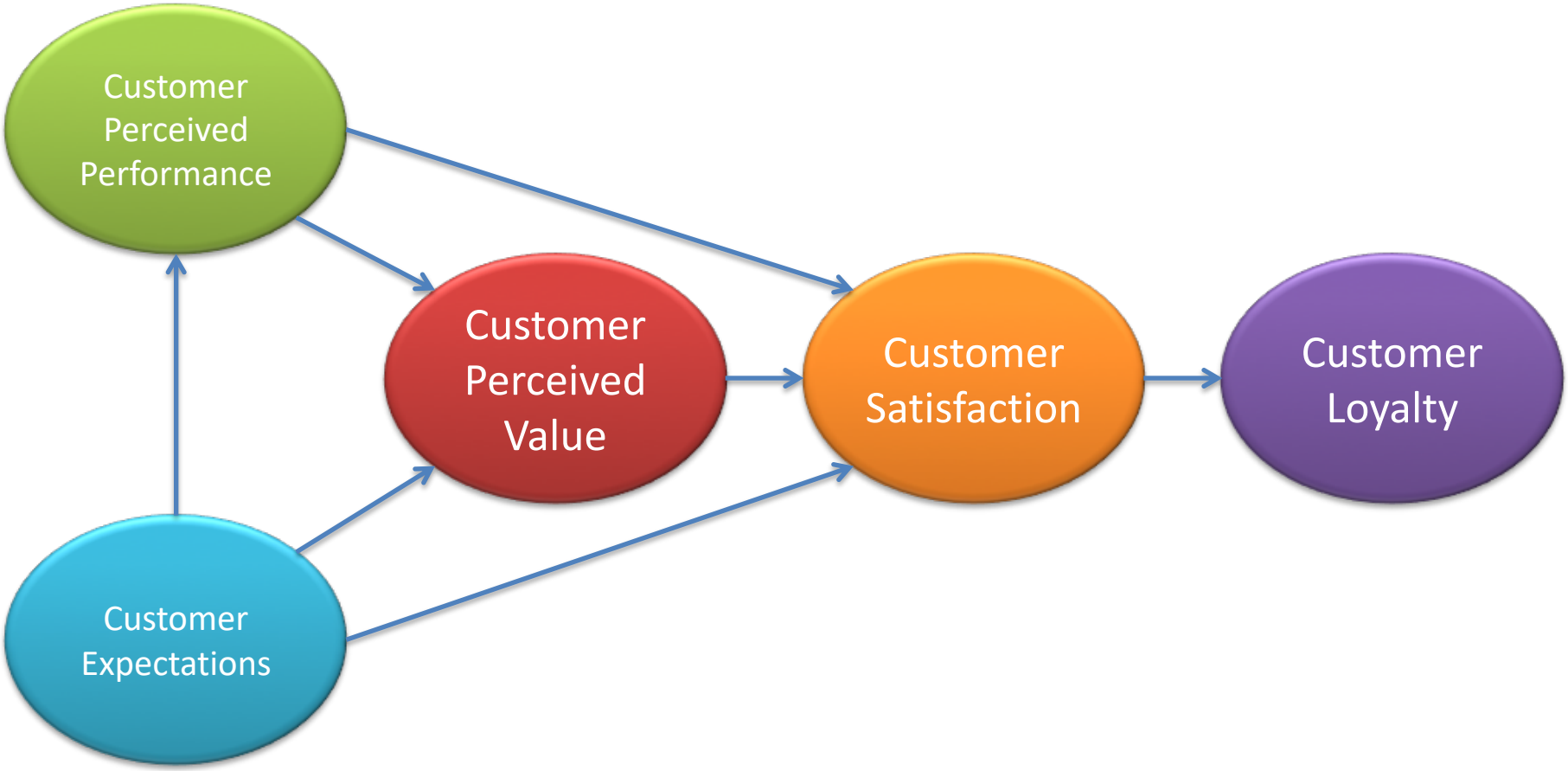


Source: Philip Kotler & Kevin Lane Keller, Marketing Management, 14th ed., Pearson, 2012

Building Customer Value, Satisfaction, and Loyalty

Source: Philip Kotler & Kevin Lane Keller, Marketing Management, 14th ed., Pearson, 2012

Customer Perceived Value, Customer Satisfaction, and Loyalty



Source: Philip Kotler & Kevin Lane Keller, Marketing Management, 14th ed., Pearson, 2012

Theory of Reasoned Action (TRA)

Source: Fishbein, M., & Ajzen, I. (1975). Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. Reading, MA: Addison-Wesley.

TRA (1975)

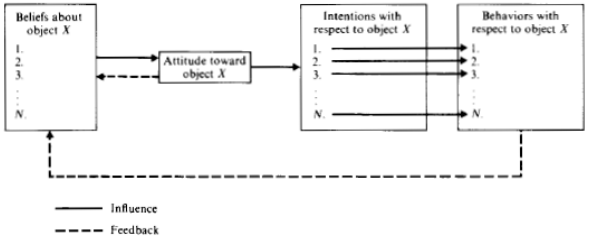


Fig. 1.1 Schematic presentation of conceptual framework relating beliefs, attitudes, intentions, and behaviors with respect to a given object.

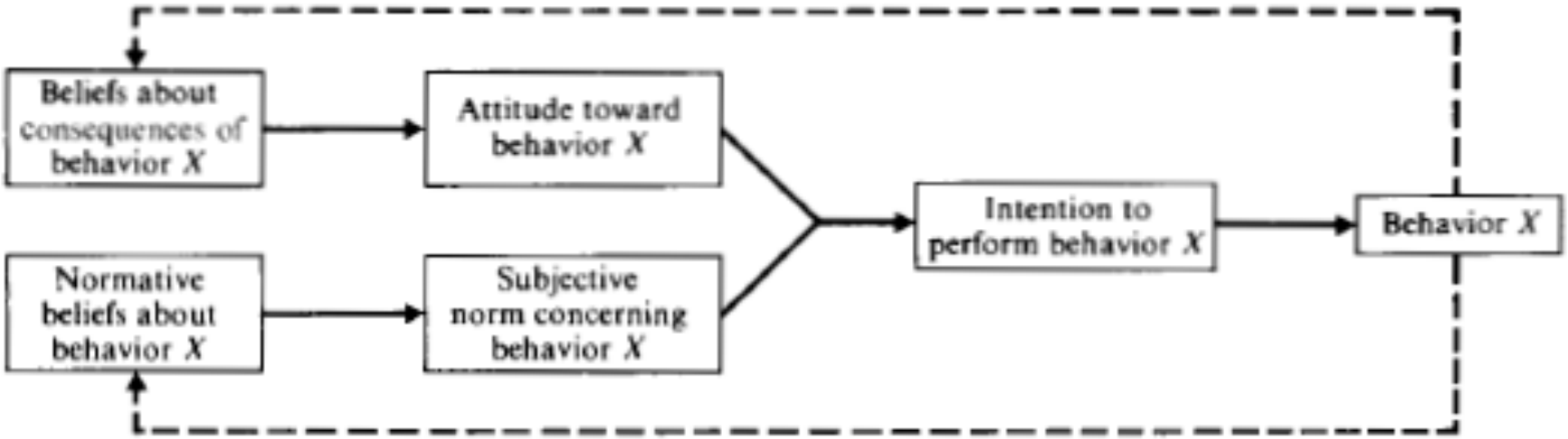


Fig. 1.2 Schematic presentation of conceptual framework for the prediction of specific intentions and behaviors.

Source: Fishbein, M., & Ajzen, I. (1975). Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. Reading, MA: Addison-Wesley.

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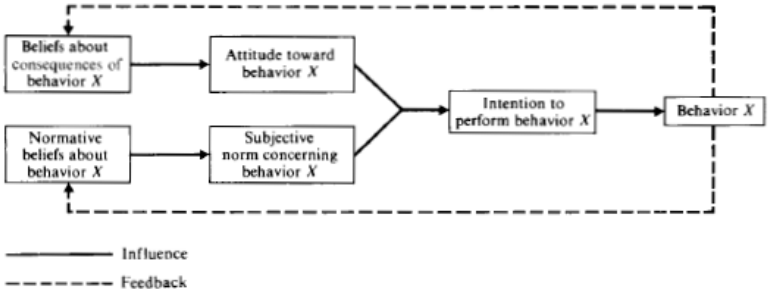


Fig. 1.2 Schematic presentation of conceptual framework for the prediction of specific intentions and behaviors.

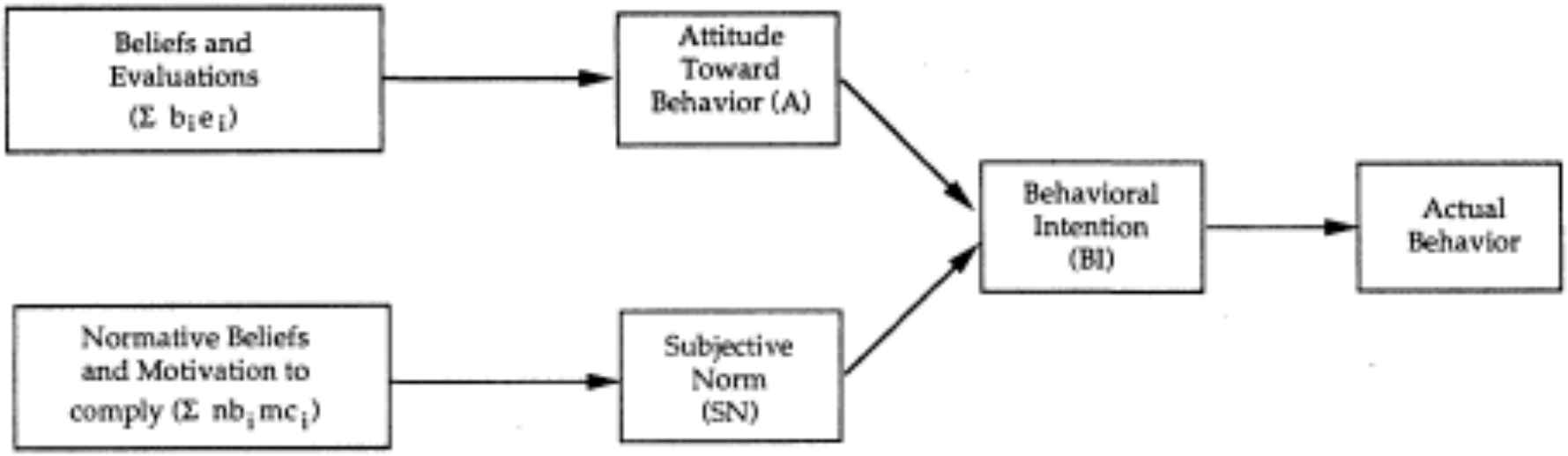


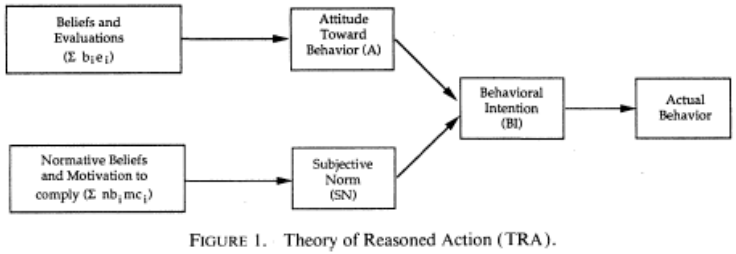
FIGURE 1. Theory of Reasoned Action (TRA).

Davis,F.D.,R.P.Bagozzi and P.R.Warshaw,"User acceptance of computer technology : A comparison of two theoretical models ",Management Science,35(8),August 1989,pp.982-1003

Theory of Planned Behavior (TPB)

Source: Ajzen, I., (1985) “From Intentions to Actions: A Theory of Planned Behavior,” in J. Kuhl and J. Beckmann (Eds.) Action Control: From Cognition to behavior, Springer Verlag, New york, 1985, pp.11-39.

TPB (1985)



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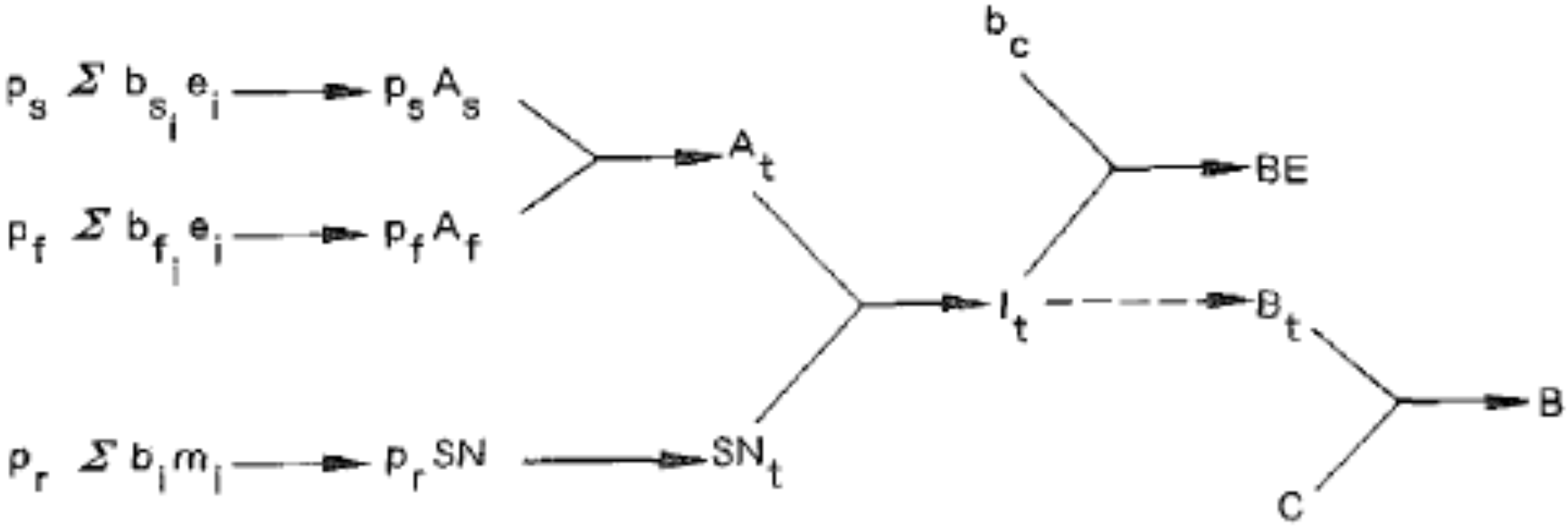


Fig. 2.1. Schematic presentation of the theory of planned behavior

Ajzen, I., (1985) "From Intentions to Actions: A Theory of Planned Behavior," in J. Kuhl and J. Beckmann (Eds.) Action Control: From Cognition to behavior, Springer Verlag, New york, 1985, pp.11-39.

TPB (1989)

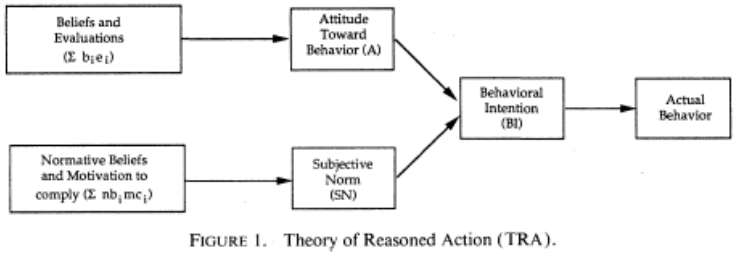


FIGURE 1. Theory of Reasoned Action (TRA).

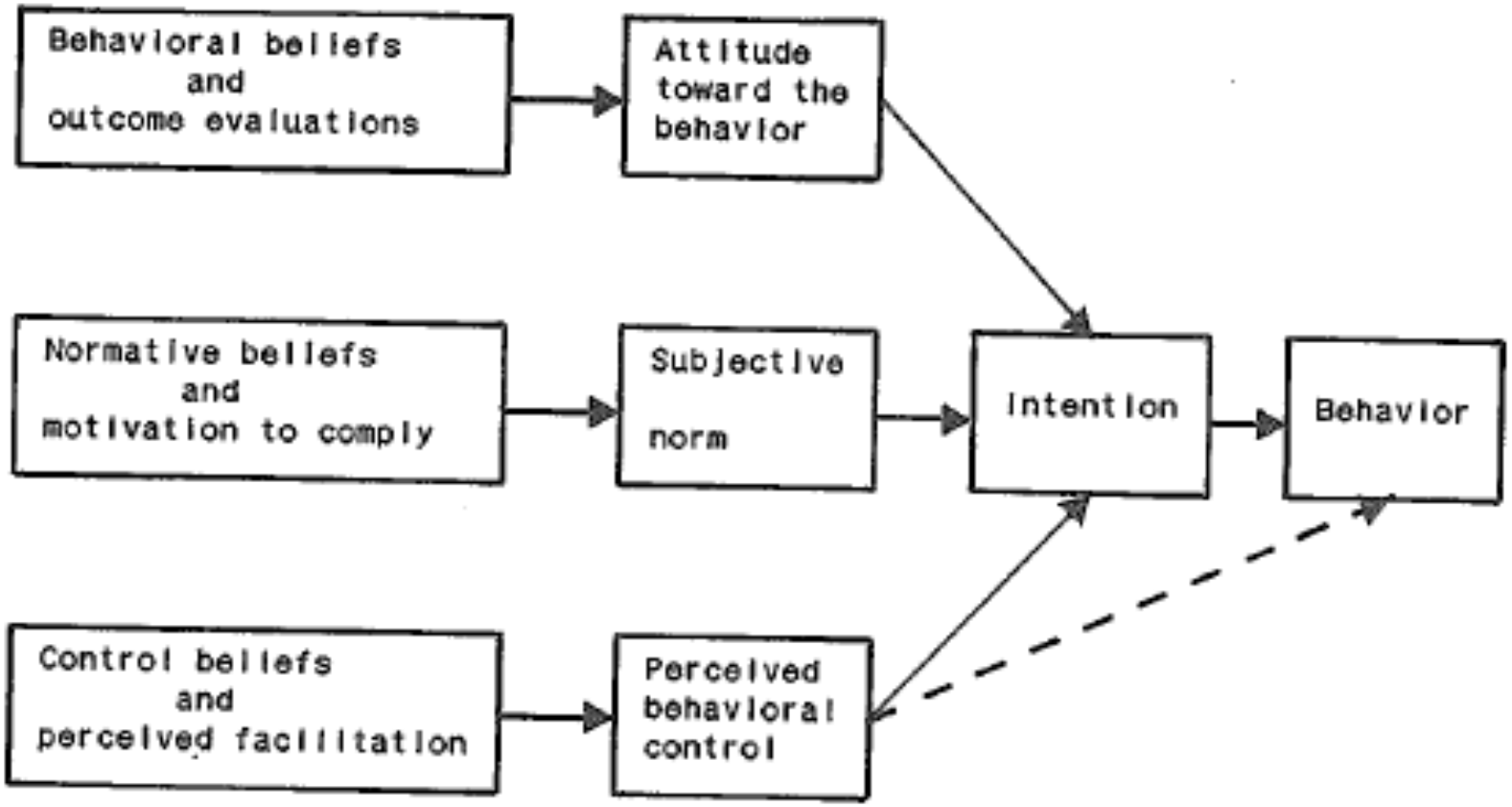


FIG. 10.2. Theory of planned behavior.

Ajzen, I., (1989) "Attitude Structure and Behavior," in A. R. Pratkanis, S. J. Breckler, and A. G. Greenwald(Eds.), Attitude Structure and Function, Lawrence Erlbaum Associates, Hillsdale, NJ, 1989, pp.241-274.

TPB (1991)

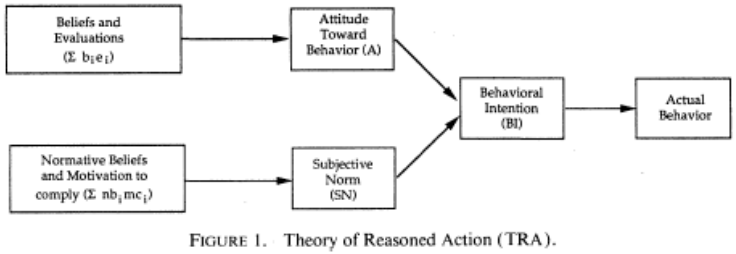


FIGURE 1. Theory of Reasoned Action (TRA).

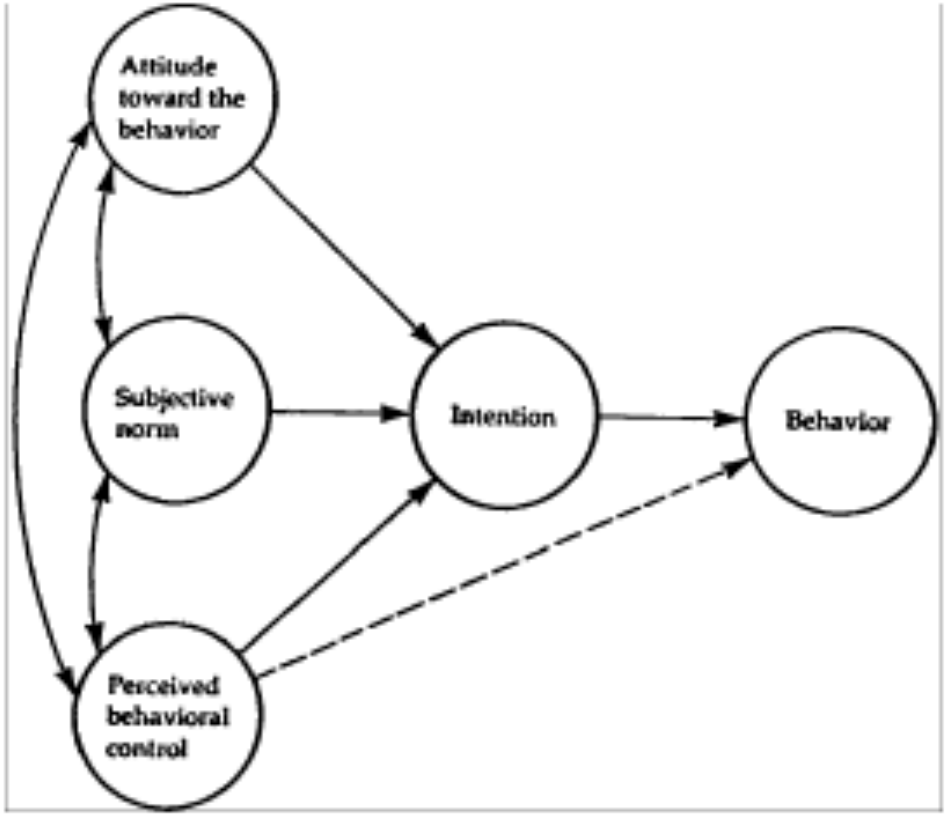
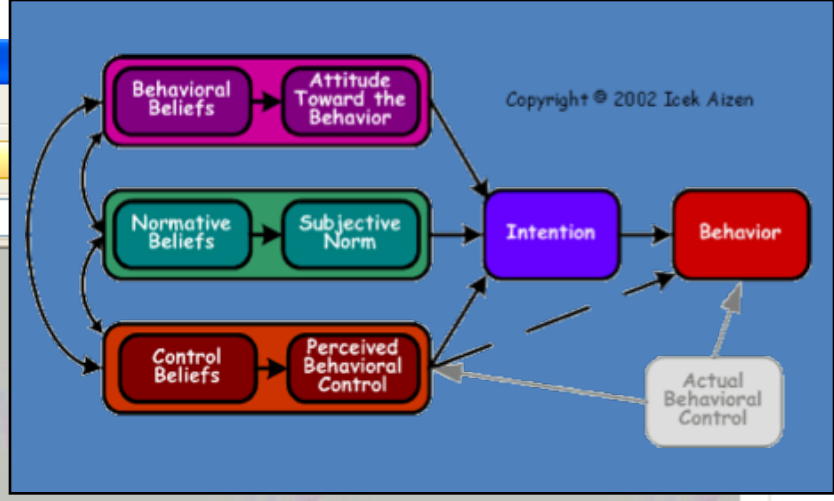


FIG. 1. Theory of planned behavior

Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50, 179-211.



Icek Aizen (Ajzen): Homepage - Microsoft Internet Explorer

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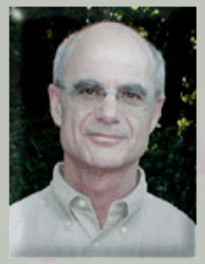
網址(D) http://www.people.umass.edu/aizen/index.html



Icek Aizen (Ajzen)

Professor of Psychology
University of Massachusetts

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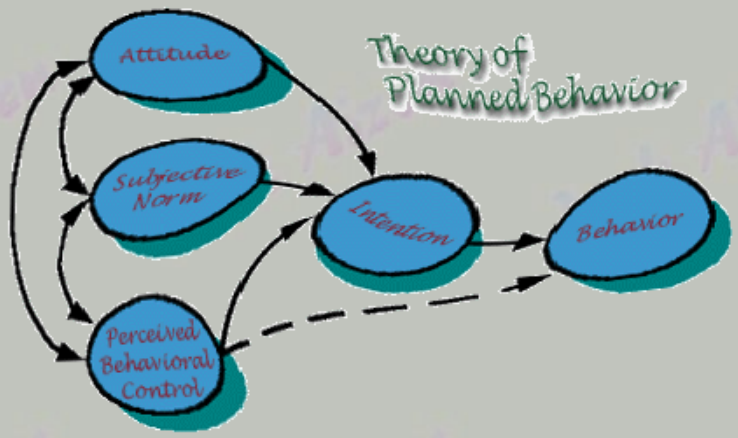


Theory of Planned Behavior

Last modified: April 13, 2005

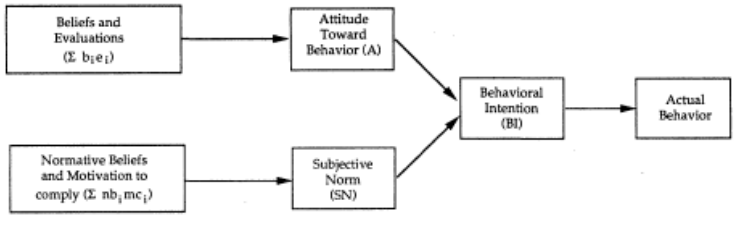
網際網路

http://www.people.umass.edu/aizen/index.html

Technology Acceptance Model (TAM)

Source: Davis,F.D.,R.P.Bagozzi and P.R.Warshaw,“User acceptance of computer technology : A comparison of two theoretical models ”,Management Science,35(8),August 1989,pp.982-1003

TAM (1989)



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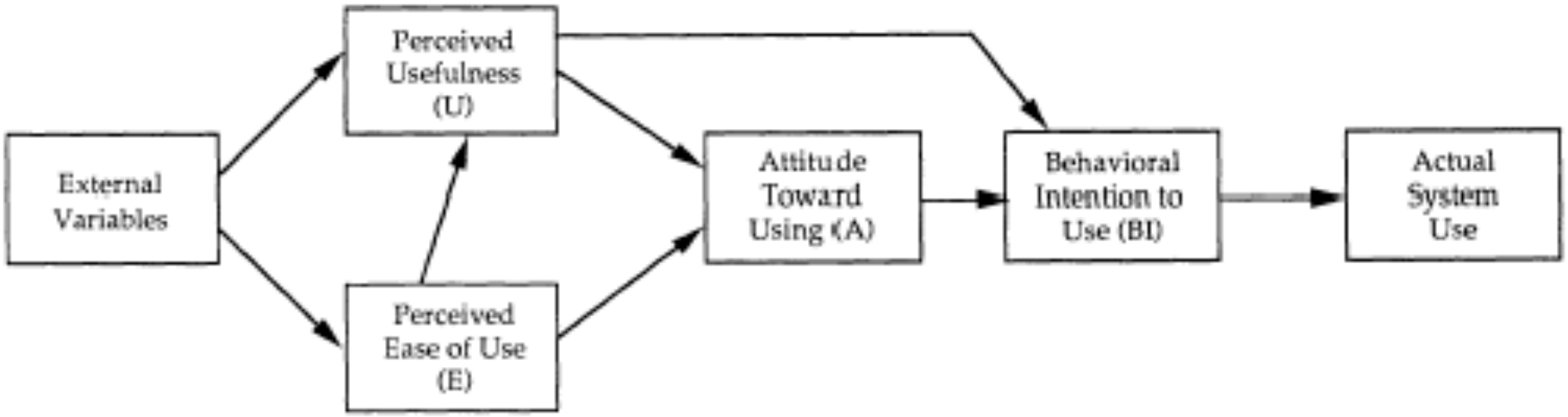


FIGURE 2. Technology Acceptance Model (TAM).

Davis,F.D.,R.P.Bagozzi and P.R.Warshaw,"User acceptance of computer technology : A comparison of two theoretical models ",Management Science,35(8),August 1989,pp.982-1003

TAM2 (2000)

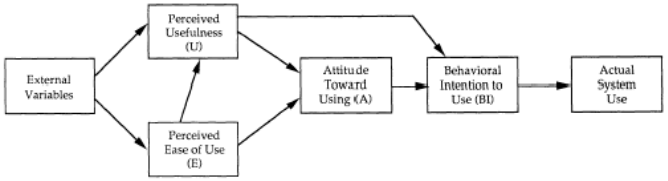
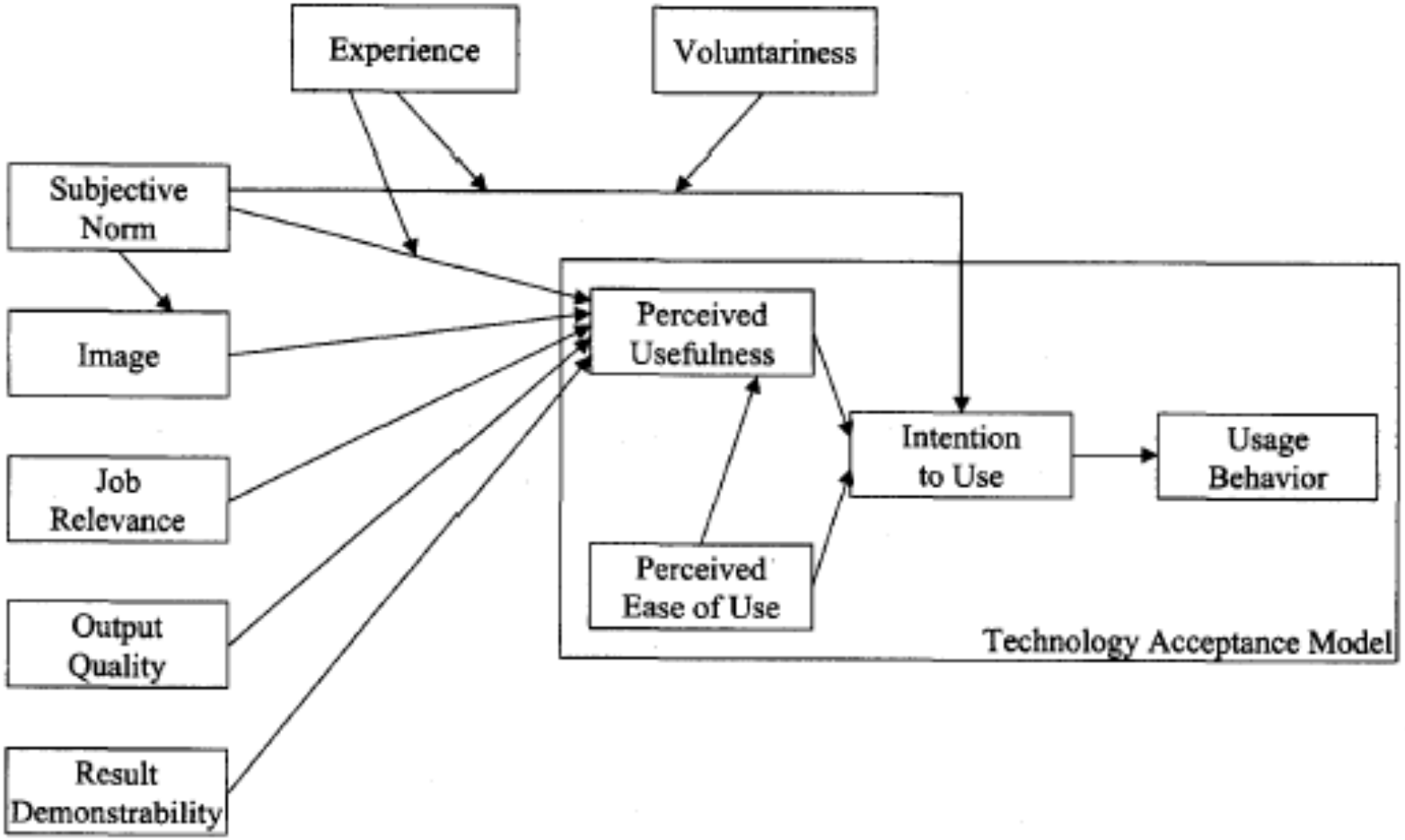


FIGURE 2. Technology Acceptance Model (TAM).

Figure 1 Proposed TAM2—Extension of the Technology Acceptance Model



Venkatesh, V., & Davis, F. D. (2000) "A theoretical extension of the technology acceptance model: Four longitudinal field studies", Management Science, 46(2), pp. 186-204.

Behavioral Finance

Rational Behavior

Irrational Behavior

Emotion

Sentiment

Modern Financial Research

- Theoretical Finance
  - study of logical relationships among assets.
- Empirical Finance
  - study of data in order to infer relationships.
- Behavioral Finance
  - integrates psychology into the investment process.

Source: Robert A. Strong (2004), Practical Investment Management, South-Western

Psychology in Behavior Finance

- Beliefs
- Preferences
  - –Prospect theory
  - –Ambiguity aversion

Source: Barberis, Nicholas, and Richard Thaler. "A survey of behavioral finance." *Handbook of the Economics of Finance* 1 (2003): 1053-1128.

Behavioral Finance Themes

- Heuristic-Driven Bias
- Framing Dependence
- Inefficient Markets

Source: Hersh Shefrin (2007), “Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing”, Oxford University Press.

Efficient Market Hypothesis (EMH)

Source: Hersh Shefrin (2007), “Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing”, Oxford University Press.

Expected Utility Theory (EUT)

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Prospect theory: An analysis of decision under risk

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Prospect Theory

(Kahneman and Tversky, 1979)

ECONOMETRICA

VOLUME 47 MARCH, 1979 NUMBER 2

PROSPECT THEORY: AN ANALYSIS OF DECISION UNDER RISK

BY DANIEL KAHNEMAN AND AMOS TVERSKY[1]

This paper presents a critique of expected utility theory as a descriptive model of decision making under risk, and develops an alternative model, called prospect theory. Choices among risky prospects exhibit several pervasive effects that are inconsistent with the basic tenets of utility theory. In particular, people underweight outcomes that are merely probable in comparison with outcomes that are obtained with certainty. This tendency, called the certainty effect, contributes to risk aversion in choices involving sure gains and to risk seeking in choices involving sure losses. In addition, people generally discard components that are shared by all prospects under consideration. This tendency, called the isolation effect, leads to inconsistent preferences when the same choice is presented in different forms. An alternative theory of choice is developed, in which value is assigned to gains and losses rather than to final assets and in which probabilities are replaced by decision weights. The value function is normally concave for gains, commonly convex for losses, and is generally steeper for losses than for gains. Decision weights are generally lower than the corresponding probabilities, except in the range of low probabilities. Overweighting of low probabilities may contribute to the attractiveness of both insurance and gambling.

Source: v.

Decision Making under Risk

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Which of the following would you prefer?

- A:
  - –50% chance to win 1,000,
  - –50% chance to win nothing;
- B:
  - –450 for sure.

Which of the following would you prefer?		
A:	50% chance to win 1,000, 50% chance to win nothing;	B: 450 for sure.

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Decision

PROBLEM 1: Choose between

A:	2,500 with probability	.33,	B:	2,400 with certainty.
	2,400 with probability	.66,		
	0 with probability	.01;		

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Decision

PROBLEM 1: Choose between

A:	2,500 with probability	.33,	B:	2,400 with certainty.	
	2,400 with probability	.66,			
	0 with probability	.01;			
$N = 72$	[18]			[82]*	

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Decision

PROBLEM 2: Choose between

C:	2,500 with probability	.33,	D:	2,400 with probability	.34,
	0 with probability	.67;		0 with probability	.66.

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Decision

PROBLEM 2: Choose between

C:	2,500 with probability	.33,	D:	2,400 with probability	.34,
	0 with probability	.67;		0 with probability	.66.
$N = 72$	[83]*			[17]	

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Expected Utility

$$u(2{,}400) > .33u(2{,}500) + .66u(2{,}400) \text{ or } .34u(2{,}400) > .33u(2{,}500)$$

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Decision

PROBLEM 3:

A: (4,000,.80), or B: (3,000).

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Decision

PROBLEM 3:

A:	(4,000,.80),	or	B:	(3,000).
$N = 95$	[20]			[80]*

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Decision

PROBLEM 4:

C: (4,000,.20), or D: (3,000,.25).

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Decision

PROBLEM 4:

C: (4,000,.20), or D: (3,000,.25).

$N = 95$ [65]* [35]

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Decision

PROBLEM 5:

A:	50% chance to win a three-week tour of England, France, and Italy;	B:	A one-week tour of England, with certainty.
$N = 72$	[22]		[78]*

PROBLEM 6:

C:	5% chance to win a three-week tour of England, France, and Italy;	D:	10% chance to win a one-week tour of England.
$N = 72$	[67]*		[33]

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Decision

PROBLEM 7:

A: (6,000, .45), B: (3,000, .90).

$N = 66$ [14] [86]*

PROBLEM 8:

C: (6,000, .001), D: (3,000, .002).

$N = 66$ [73]* [27]

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Preferences Between Positive and Negative Prospects

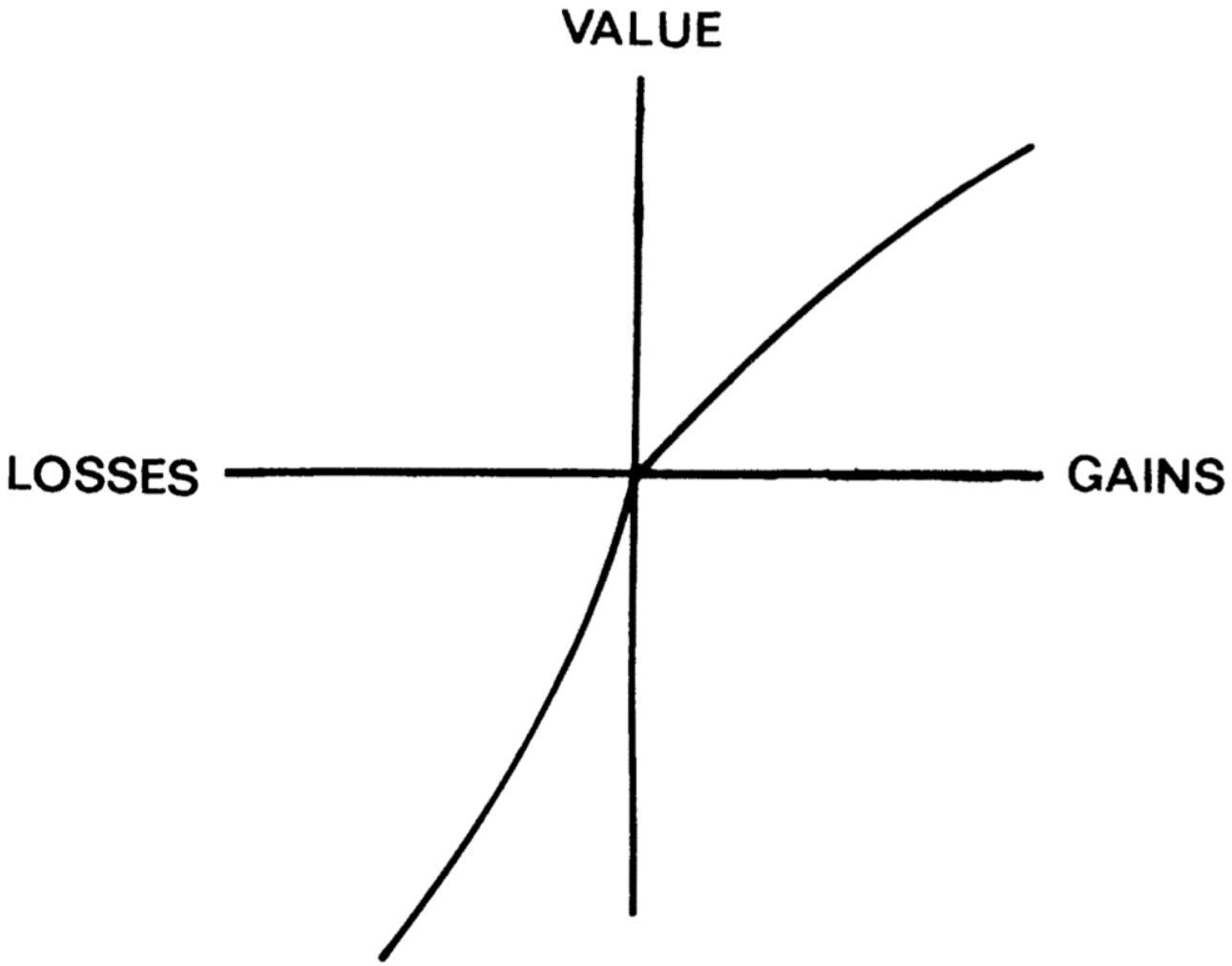
Positive prospects				Negative prospects			
Problem 3:	(4,000, .80)	<	(3,000).	Problem 3′:	(−4,000, .80)	>	(−3,000).
$N = 95$	[20]		[80]*	$N = 95$	[92]*		[8]
Problem 4:	(4,000, .20)	>	(3,000, .25).	Problem 4′:	(−4,000, .20)	<	(−3,000, .25).
$N = 95$	[65]*		[35]	$N = 95$	[42]		[58]
Problem 7:	(3,000, .90)	>	(6,000, .45).	Problem 7′:	(−3,000, .90)	<	(−6,000, .45).
$N = 66$	[86]*		[14]	$N = 66$	[8]		[92]*
Problem 8:	(3,000, .002)	<	(6,000, .001).	Problem 8′:	(−3,000, .002)	>	(−6,000, .001).
$N = 66$	[27]		[73]*	$N = 66$	[70]*		[30]

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Certainty, Probability, and Possibility

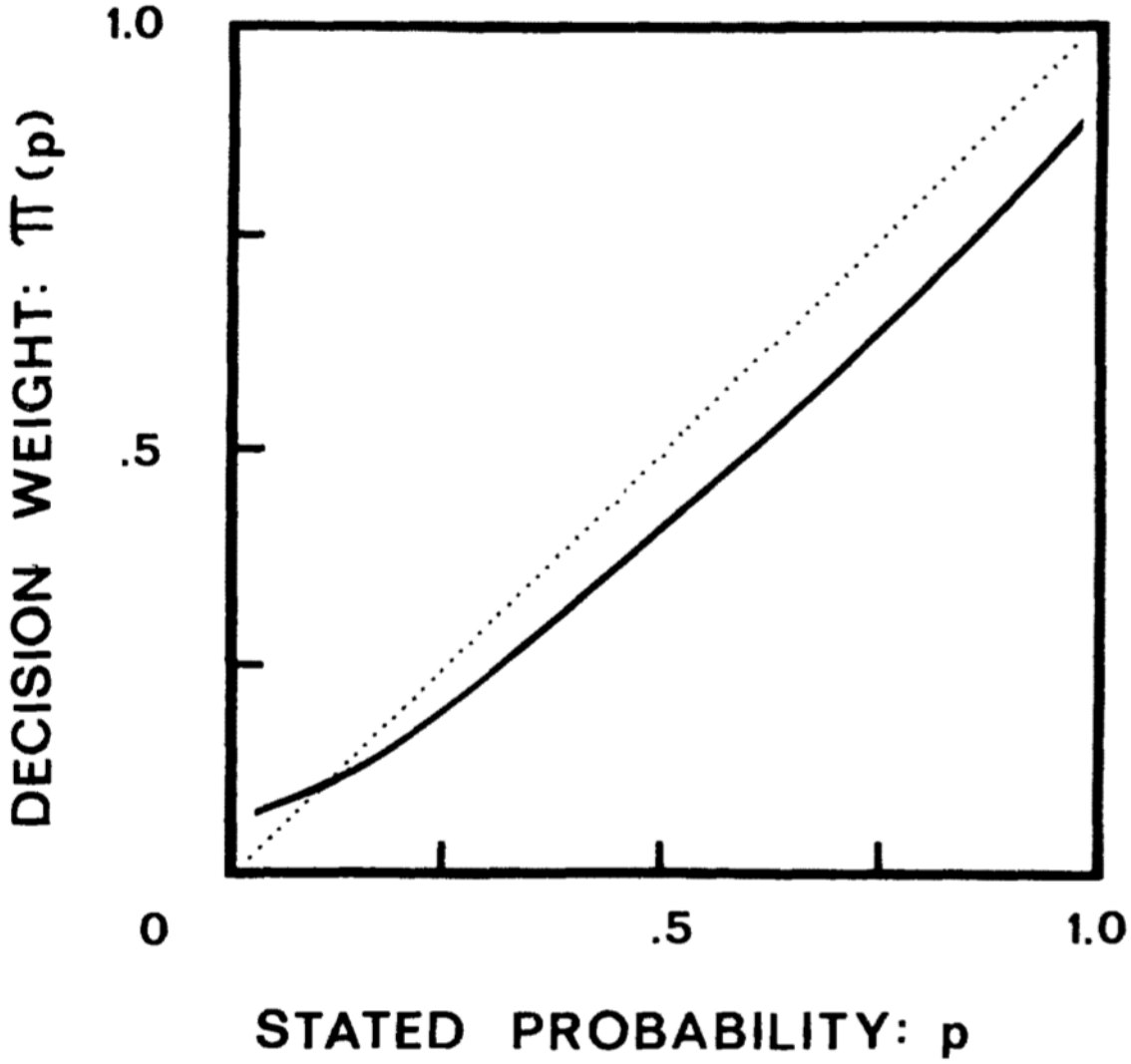
Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Prospect theory
Value Function



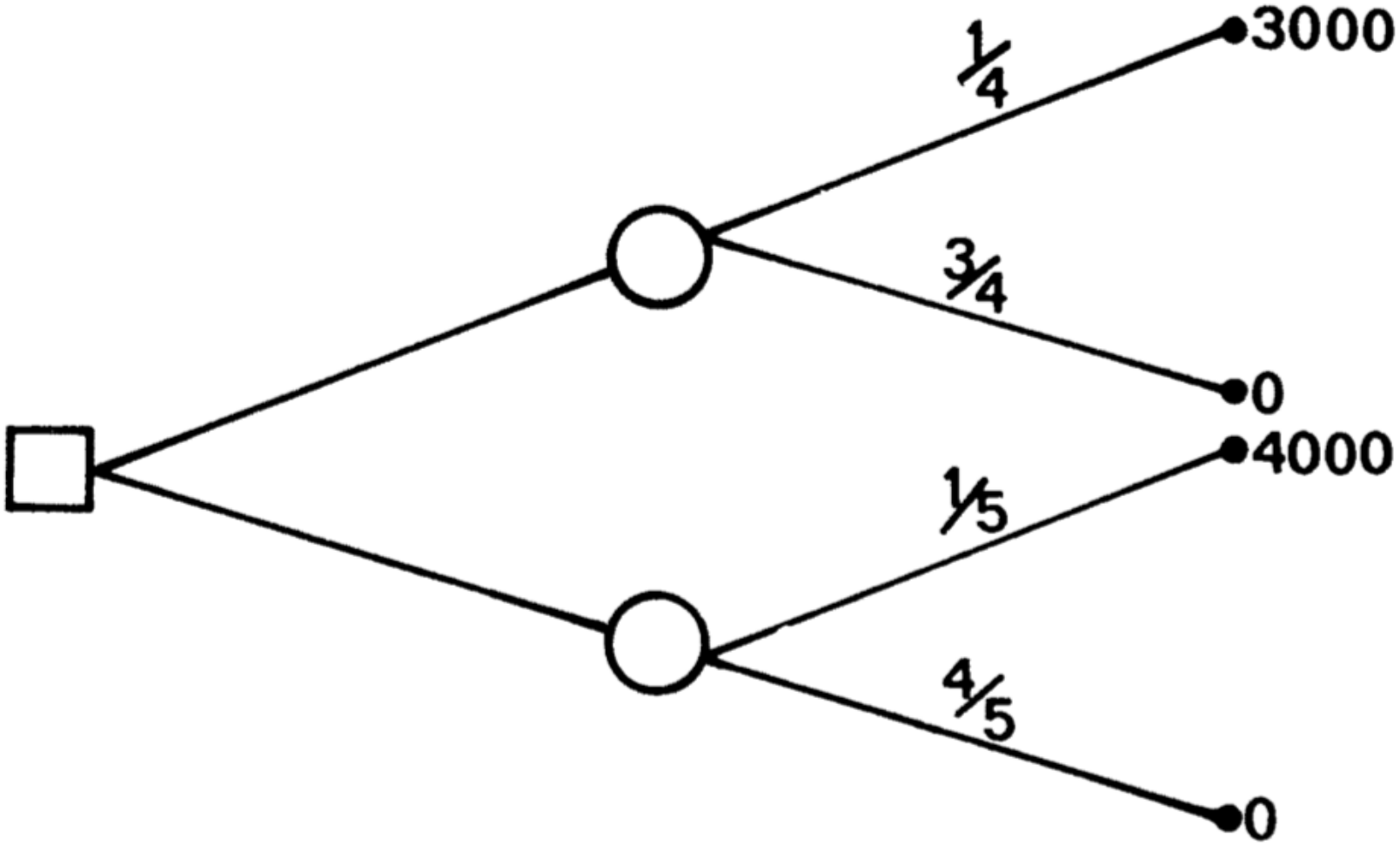
Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Prospect theory Weighting Function



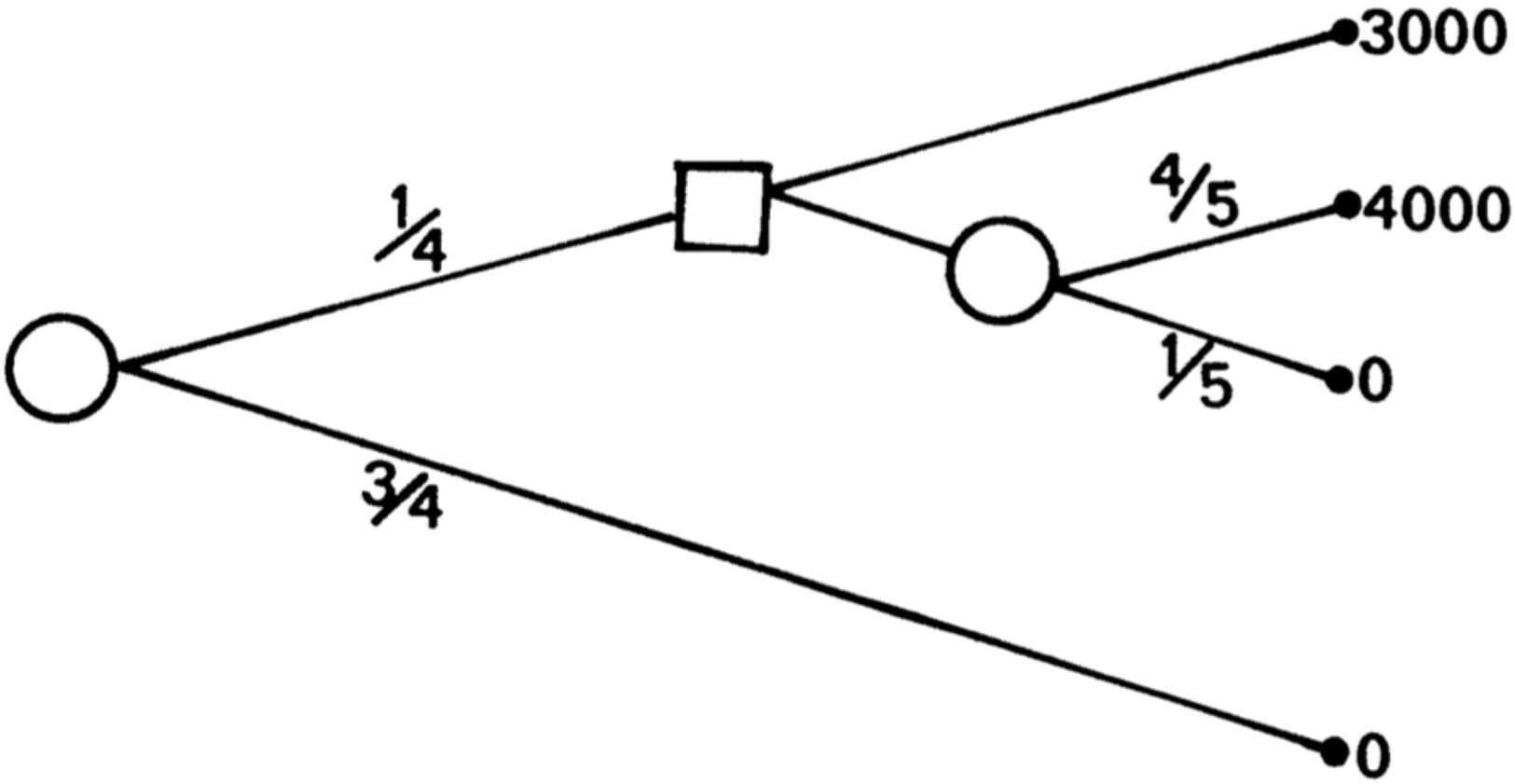
Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Problem 4 as a decision tree (standard formulation)



Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Problem 10 as a decision tree (sequential formulation)



Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Decision

PROBLEM 11: In addition to whatever you own, you have been given 1,000. You are now asked to choose between

A: (1,000, .50), and B: (500).

$N = 70$ [16] [84]*

PROBLEM 12: In addition to whatever you own, you have been given 2,000. You are now asked to choose between

C: (−1,000, .50), and D: (−500).

$N = 68$ [69*] [31]

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Decision

PROBLEM 13:

(6,000, .25), or (4,000, .25; 2,000, .25).

$N = 68$ [18] [82]*

PROBLEM 13′:

(−6,000, .25), or (−4,000, .25; −2,000, .25).

$N = 64$ [70]* [30]

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Decision

PROBLEM 14:

	(5,000, .001),	or	(5).
$N = 72$	[72]*		[28]

PROBLEM 14′:

	(−5,000, .001),	or	(−5).
$N = 72$	[17]		[83]*

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Prospect theory

- People underweight outcomes that are merely probable in comparison with outcomes that are obtained with certainty.
  - This tendency, called the certainty effect, contributes to risk aversion in choices involving sure gains and to risk seeking in choices involving sure losses.

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Prospect theory

- People generally discard components that are shared by all prospects under consideration.
  - This tendency, called the isolation effect, leads to inconsistent preferences when the same choice is presented in different form .

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Prospect theory

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Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Prospect theory

- Value is assigned to gains and losses rather than to final assets and in which probabilities are replaced by decision weights.
- The value function is normally concave for gains, commonly convex for losses, and is generally steeper for losses than for gains.

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Prospect theory

- Decision weights are generally lower than the corresponding probabilities, except in the range of low probabilities.
- Overweighting of low probabilities may contribute to the attractiveness of both insurance and gambling.

Source: Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the econometric society* (1979): 263-291.

Behavioral Heuristics and Biases in Decision Making

Behavioral Finance Anomalies

- The Rational Man
  - Consumer Choice with Certainty
  - Consumer Choice with Uncertainty
  - The Allais Paradox

Source: Edwin Burton and Sunit N. Shah (2013), “Behavioral Finance: Understanding the Social, Cognitive, and Economic Debates”, Wiley.

Prospect Theory

- The Reference Point
- The S-Curve
- Loss Aversion

Source: Edwin Burton and Sunit N. Shah (2013), “Behavioral Finance: Understanding the Social, Cognitive, and Economic Debates”, Wiley.

Behavioral Finance Anomalies

- Perception Biases
- Inertial Effects
- Causality and Statistics
- Illusions

Source: Edwin Burton and Sunit N. Shah (2013), “Behavioral Finance: Understanding the Social, Cognitive, and Economic Debates”, Wiley.

Perception Biases

- Saliency
- Framing
- Anchoring
- Sunk Cost Bias

Source: Edwin Burton and Sunit N. Shah (2013), “Behavioral Finance: Understanding the Social, Cognitive, and Economic Debates”, Wiley.

Inertial Effects

- Endowment Effect
- Status Quo Effect
- Disposition Effect

Source: Edwin Burton and Sunit N. Shah (2013), “Behavioral Finance: Understanding the Social, Cognitive, and Economic Debates”, Wiley.

Causality and Statistics

- Representativeness
- Conjunction Fallacy
- Reading into Randomness
- Small Sample Bias
- Probability Neglect

Source: Edwin Burton and Sunit N. Shah (2013), “Behavioral Finance: Understanding the Social, Cognitive, and Economic Debates”, Wiley.

Illusions

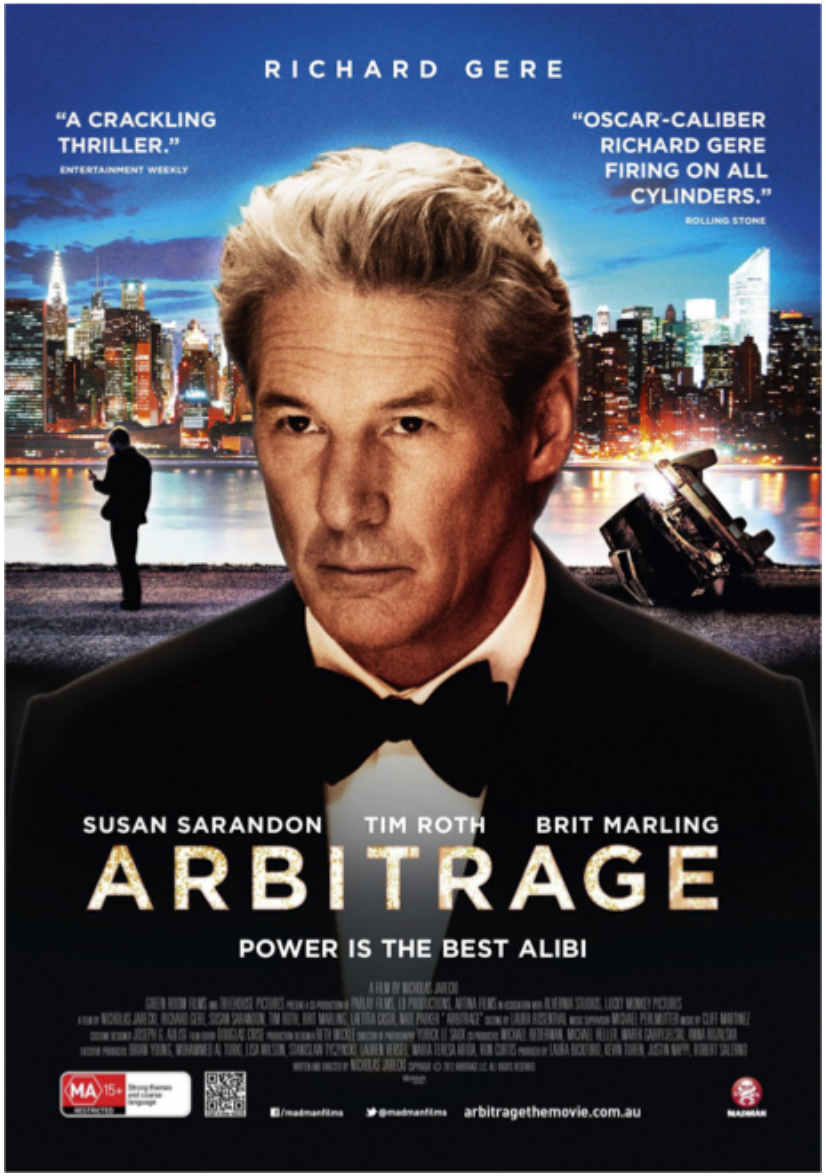
- Illusion of Talent
- Illusion of Skill
- Illusion of Superiority
- Illusion of Validity

Source: Edwin Burton and Sunit N. Shah (2013), “Behavioral Finance: Understanding the Social, Cognitive, and Economic Debates”, Wiley.

Behavioral Finance: Two Major Foundations

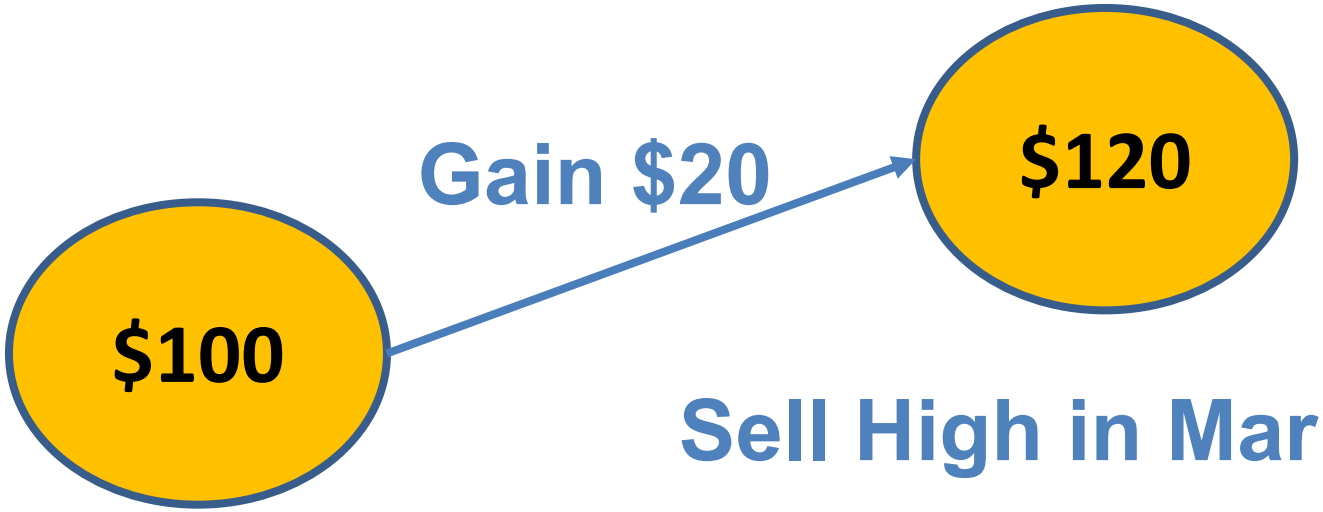
- Investor Sentiment
  - creates disturbances to efficient prices.
- Limited arbitrage
  - arbitrage is never riskfree, hence it does not counter irrational disturbances.
    - Prices may not react to information by the “right” amount.
    - Prices may react to non-information.
    - Markets may remain efficient.

Arbitrage



Source: http://www.beliefnet.com/columnists/moviemom/2012/09/interview-nicholas-jarecki-of-arbitrage.html

Arbitrage



Heuristics

- Overconfidence
  - people overestimate the reliability of their knowledge.
- Excessive trading
- Framing Effect

Heuristics

- Regret Aversion
  - anticipation of a future regret can influence current decision.
- Disposition Effect
  - sell winners, hold on to the losers.
- Anchoring and adjustment: can create under-reaction.

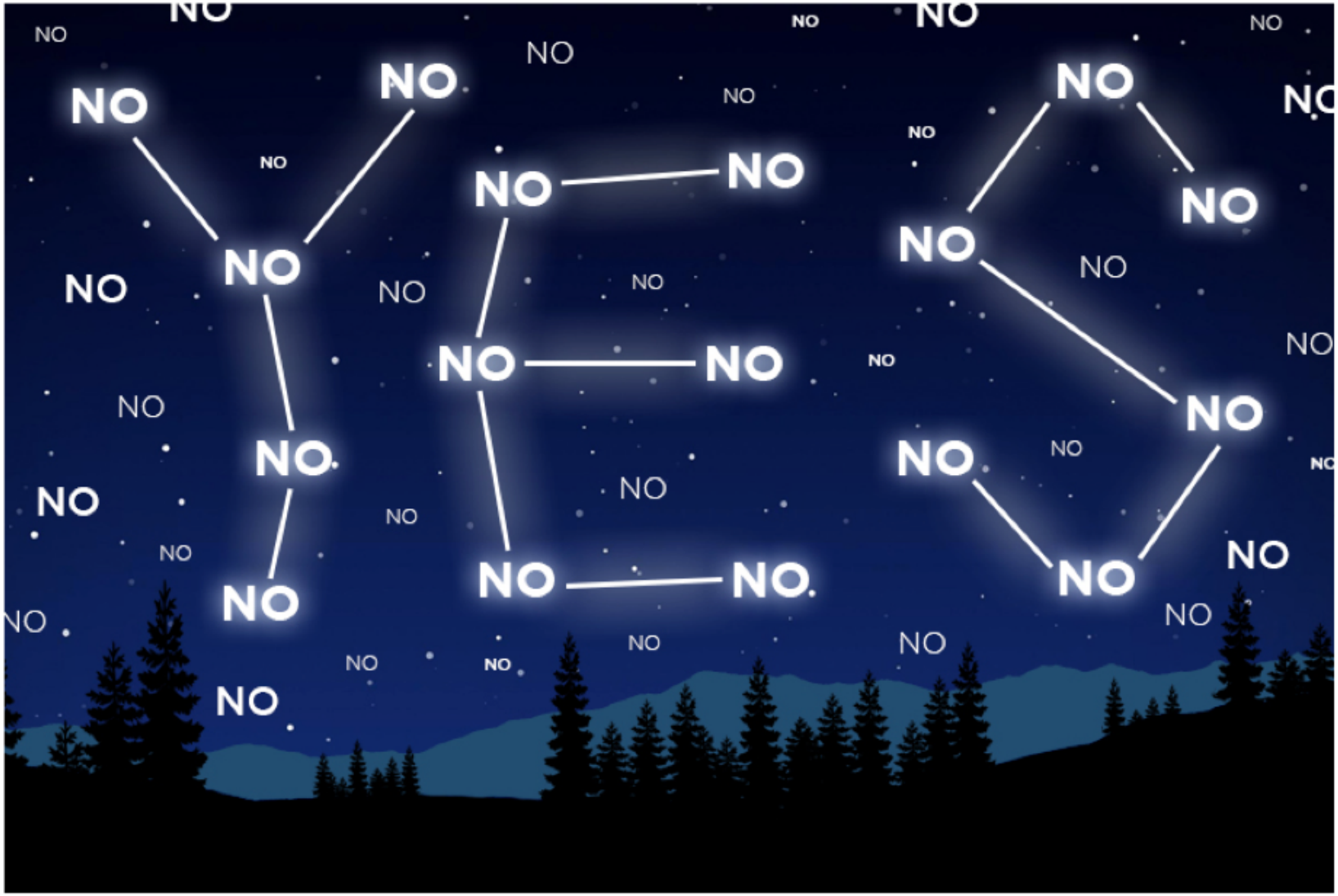
Fashions and Fads

- People are influenced by each other. There is a social pressure to conform.
- Herding behavior: “safety-in-numbers”.
- Informational Cascades
- Positive Feedback
- Example: excessive demand for internet IPOs. Extremely high opening day returns.

Social Influences

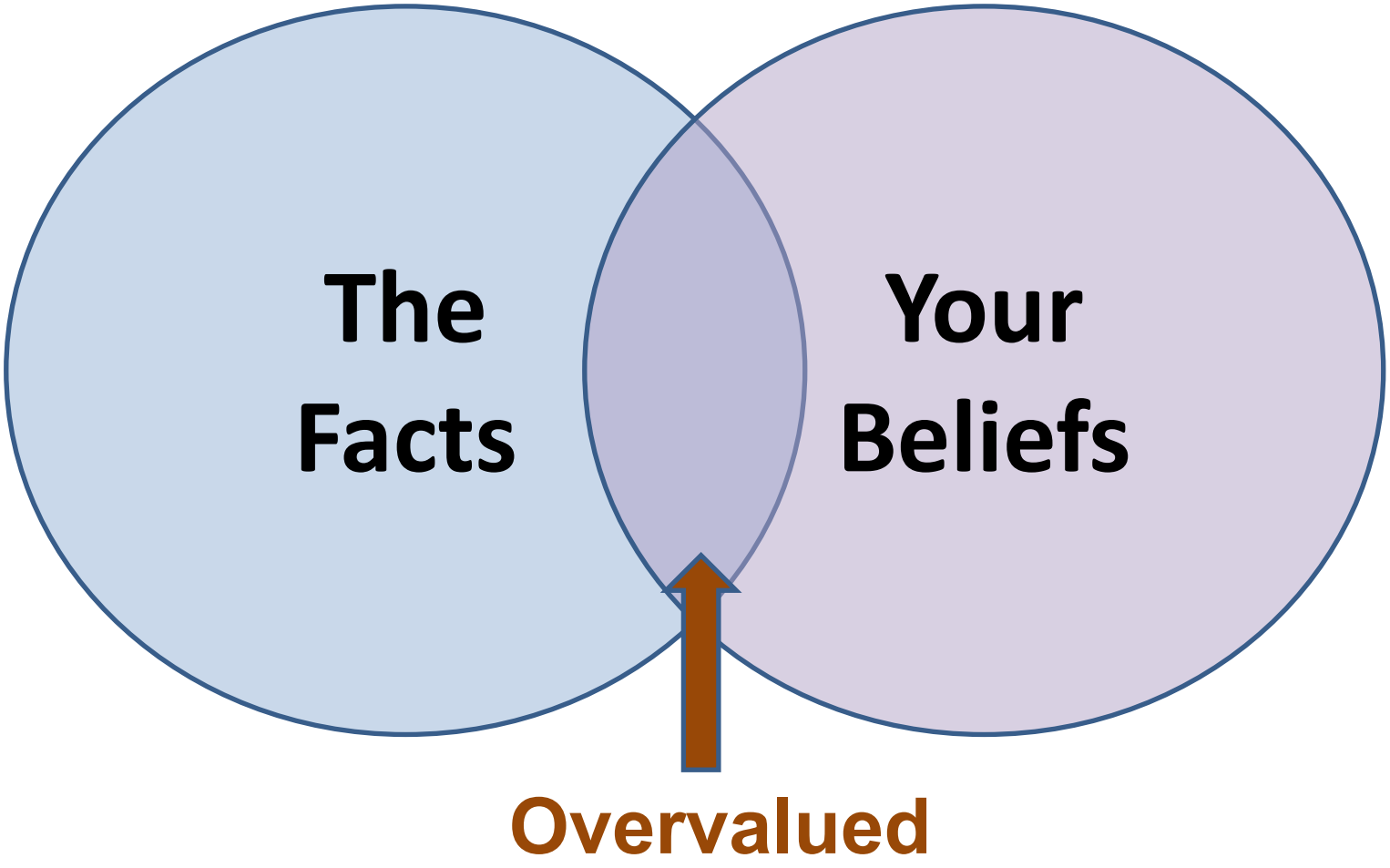
- Social norms
  - The informal opinions, rules, and procedures of a group.
  - Your piers and social groups influence your investment participation
- Herding Behavior
  - The movement into or out of a stock or industry of companies by large groups of investors.

Psychology of Belief
Confirmation Bias



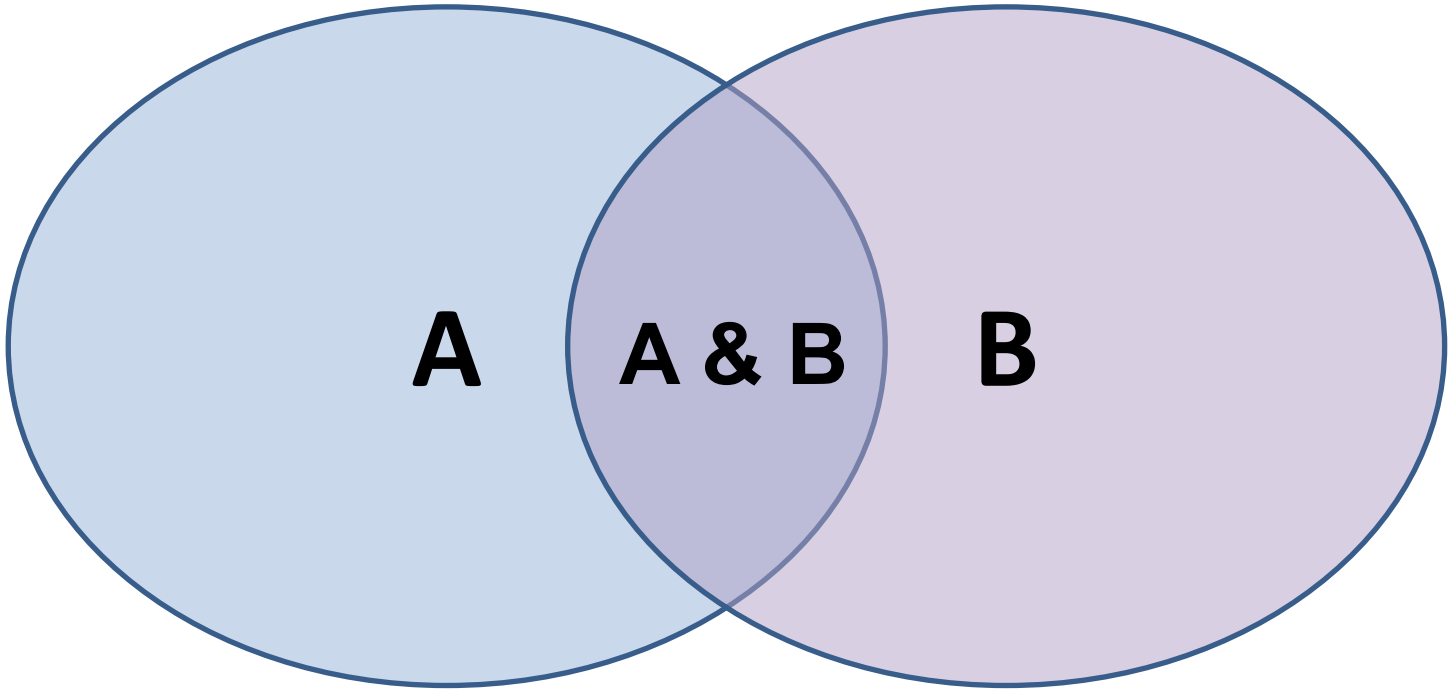
Source: https://www.interaction-design.org/literature/article/confirmation-bias-it-s-not-what-we-think-we-know-that-counts

Confirmation Bias



Source: Robert A. Strong (2004), Practical Investment Management, South-Western

Representativeness Heuristic



P (A & B) < P (A) or P (B)

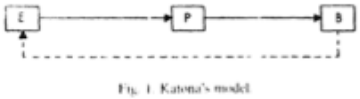
Source: Robert A. Strong (2004), Practical Investment Management, South-Western

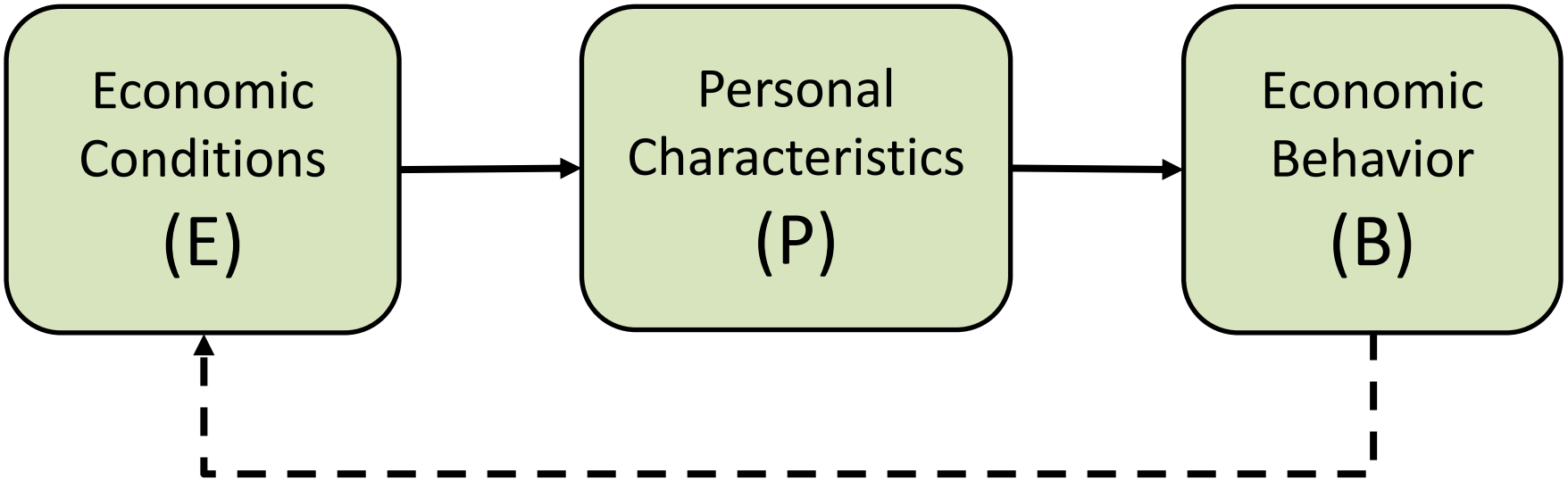
Herding Behavior

- Herding refers to the lemming-like behavior of investors and analysts looking around, seeing what each other is doing, and heading in that direction.
- There may not have been safety in numbers, but there probably was some comfort in them.

Source: Robert A. Strong (2004), Practical Investment Management, South-Western v

Katona's Economic Psychology Model





Source: Van Raaij, W. Fred. "Economic psychology." *Journal of Economic Psychology* 1, no. 1 (1981): 1-24.

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