Neuroeconomics

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Goal

• Use knowledge about the brain and genetics to better understand and predict economic behavior
Questions

• What determines people’s attitudes towards taking financial risk?
  – within individual
  – across individuals

• What determines people’s ability to learn from financial information?
  – within individual
  – across individuals
Broad answer

• Brain and genetic mechanisms related to emotion are significant determinants of people’s:
  – preference to take or avoid financial risk
  – ability to learn from information in financial markets
**Anterior Insula**
- avoidance behaviors
- activation → anxiety
- neurotransmitter: Serotonin

**Nucleus Accumbens**
- approach behaviors
- activation → excitement
- neurotransmitter: Dopamine

**Prefrontal cortex**
- emotional control, learning, strategic decisions
- neurotransmitter: Dopamine
Financial risk preferences: Within-individual effects

• ↑ Nucleus Accumbens, ↓ Anterior Insula activation → Stronger preference for investing in risky stocks rather than safe bonds (Kuhnen and Knutson (2005))

• Exogenous manipulation of activation in these centers leads to a change in risk preferences (Knutson, Wimmer, Kuhnen and Winkielman (2008))

• Same person shows different preferences in different settings
  – If given anxiety-, rather than excitement-inducing news unrelated to financial choice at hand, people prefer to avoid risky financial assets (Kuhnen and Knutson (2011))
  – With aging, activation in these areas becomes more noisy, and this explains why older adults are less consistent, and make more errors in financial choices (Samanez-Larkin, Kuhnen, Yoo and Knutson (2010))
Financial risk preferences: Across-individuals effects

- Differences across people in the propensity to take financial risk driven in part by genes related to serotonin and dopamine: 5HTTLPR, DRD4 (Kuhnen and Chiao (2009))
  - Short 5HTTLPR and DRD4 alleles predict avoidance of financial risk

- The serotonin transporter gene (5HTTLPR) effect on avoiding risky and complex financial decisions is mediated by neuroticism and negative affect (Kuhnen, Knutson and Samanez-Larkin (2012))
Learning in financial markets: Within-individual effects

- Exogenous affect manipulations change investors’ confidence in their ability to assess the profitability of financial assets (Kuhnen and Knutson (2011))

- The ability to learn from news in financial markets is context dependent: it is worse in the loss domain (negative news), relative to the gain domain (positive news), especially when the investors’ stakes are larger → Overly pessimistic beliefs (Kuhnen (2012))

- Gain learning and loss learning predict different aspects of real-life financial decisions: asset accumulation vs. debt avoidance (Knutson, Samanez-Larkin and Kuhnen (2011))
Learning in financial markets: Across-individuals effects

- Differences across people in the ability to learn from financial information are driven by:
  - Acquired financial knowledge $\rightarrow$ more accurate beliefs about investment options, better choices (Kuhnen (2012))
  - Innate factor - the COMT gene - related to working memory and emotion control in the prefrontal cortex (Kuhnen (2012))
    - COMT Met/Met genotype $\rightarrow$ better learning, choices
    - Genetic effect disappears in individuals with high financial knowledge $\rightarrow$ financial training can overcome genetic disadvantage
  - Socioeconomic status: Low SES in childhood leads to worse working memory, emotion control later $\rightarrow$ worse learning and financial choices (Romanian sample, Kuhnen and Miu (2013))
Summary

• Neural and genetic mechanisms related to emotion, personality, education, socioeconomic status are inter-related drivers of economic choice

• Understanding the biology behind choice helps us better understand:
  – investors
  – consumers
  – decision-makers in organizations
  – ourselves