Prospect Theory Applications in Finance

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Overview

• in behavioral finance, we investigate whether certain financial phenomena are the result of less than fully rational thinking

Preferences

• prospect theory
• ambiguity aversion

Beliefs

• representativeness, law of small numbers
• non-belief in the law of large numbers
• conservatism, belief perseverance, confirmation bias
• overconfidence

• in this note, we look at prospect theory applications in finance
Overview, ctd.

• almost all models of financial markets assume that investors evaluate risk according to expected utility
  – but this framework has had trouble matching many empirical facts

• can we make progress by replacing expected utility with a psychologically more realistic preference specification?
  – e.g. with prospect theory
Prospect Theory

Consider the gamble \((x, p; y, q)\)

- under EU, it is assigned the value
  \[ pU(W + x) + qU(W + y) \]
- under Prospect Theory, it is assigned the value
  \[ \pi(p)v(x) + \pi(q)v(y) \]
Prospect Theory, ctd.

Four key features:

• the carriers of value are gains and losses, not final wealth levels
  – compare $v(x)$ vs. $U(W + x)$

• $v(\cdot)$ has a kink at the origin
  – captures a greater sensitivity to losses (even small losses) than to gains of the same magnitude
  – “loss aversion”
  – inferred from aversion to $(110, \frac{1}{2}; -100, \frac{1}{2})$

• $v(\cdot)$ is concave over gains, convex over losses
  – inferred from $(500, 1) \succ (1000, \frac{1}{2})$ and $(-500, 1) \prec (-1000, \frac{1}{2})$
Prospect Theory, ctd.

• transform probabilities with a weighting function $\pi(\cdot)$ that overweights low probabilities
  
  – inferred from our simultaneous liking of lotteries and insurance, e.g. $(5,1) \prec (5000, 0.001)$ and $(-5,1) \succ (-5000, 0.001)$

Note:

• transformed probabilities should not be thought of as beliefs, but as decision weights
Cumulative Prospect Theory

• proposed by Tversky and Kahneman (1992)

• applies the probability weighting function to the cumulative distribution function:

\[
(x_{-m}, p_{-m}; \ldots; x_1, p_1; x_0, p_0; x_1, p_1; \ldots; x_n, p_n),
\]

where \( x_i < x_j \) for \( i < j \) and \( x_0 = 0 \), is assigned the value

\[
\sum_{i=-m}^{n} \pi_i v(x_i)
\]

\[
\pi_i = \begin{cases} 
\pi(p_i + \ldots + p_n) - \pi(p_{i+1} + \ldots + p_n) & \text{for } 0 \leq i \leq n \\
\pi(p_{-m} + \ldots + p_i) - \pi(p_{-m} + \ldots + p_{i-1}) & \text{for } -m \leq i < 0 
\end{cases}
\]

• the agent now overweights the tails of a probability distribution

  – this preserves a preference for lottery-like gambles
Tversky and Kahneman (1992) also suggest functional forms for $v(\cdot)$ and $\pi(\cdot)$ and calibrate them to experimental evidence:

$$v(x) = \begin{cases} x^\alpha & \text{for } x \geq 0 \\ -\lambda(-x)^\alpha & \text{for } x < 0 \end{cases}$$

$$\pi(P) = \frac{P^\delta}{(P^\delta + (1 - P)^\delta)^{1/\delta}}$$

with

$$\alpha = 0.88, \lambda = 2.25, \delta = 0.65$$
Figure 2. The figure shows the form of the probability weighting function proposed by Tversky and Kahneman (1992), namely $w(P) = P^\delta/(P^\delta + (1 - P)^\delta)^{1/\delta}$. The dashed line corresponds to $\delta = 0.65$, the dash-dot line to $\delta = 0.4$, and the solid line to $\delta = 1$. 
Narrow framing

• in traditional models, an agent evaluates a new gamble by merging it with his pre-existing risks and checking if the combination is attractive.

• but in experimental settings, people often seem to evaluate a new gamble in isolation (Tversky and Kahneman, 1981)
  – this is “narrow framing”
  – get utility directly from the outcome of the gamble, not just indirectly from its contribution to total wealth.

• e.g. the rejection of a 50:50 bet to win $110 or lose $100 is probably evidence not only of loss aversion, but also of narrow framing.
  – Barberis, Huang, Thaler (2006); Koszegi and Rabin (2007)
Narrow framing, ctd.

• in what follows, we sometimes take prospect theory’s “gains” and “losses” to be gains and losses in specific components of wealth
  – e.g. gains and losses in stock market wealth, or in a specific stock

• we lack a full theory of narrow framing, but possible elements are:
  – anchoring on the first thing you think of
  – accessibility (Kahneman, 2003)
  – regret

• we interpret utility from gains and losses in (components of) wealth as utility from news about future consumption
  – but narrow framing strains this interpretation slightly
Prospect theory applications

[1]

• the cross-section of stock returns
  – one-period models
  – new prediction: the pricing of skewness
  – probability weighting plays the most critical role

[2]

• the aggregate stock market
  – intertemporal representative agent models
  – try to address the equity premium, volatility, predictability, and non-participation puzzles
  – loss aversion plays a key role; but probability weighting also matters

[3]

• trading behavior
  – multi-period models
  – try to address the disposition effect and other trading phenomena
  – all aspects of prospect theory play a role
Prospect theory applications, ctd.

Note:

• in all applications, we have to decide on the degree of narrow framing
  – not easy, given the lack of a full theory of framing

• also need to decide on the reference point relative to which gains and losses are computed
  – typically take the reference point to be initial wealth scaled up by the risk-free rate

• the risk-free rate is, in some ways, a more plausible reference point than “expectations”
  – it is much more salient; and is a natural default return

• preliminary quantitative calculations (see later) also cast some doubt on “expectations” as the unique reference point

• a conjecture is that the reference point lies somewhere between the risk-free rate and the expected return
Themes

• prospect theory is helpful for thinking about financial phenomena
  – particularly a model that applies prospect theory to gains and losses in financial wealth

• for finance applications, *probability weighting* may be the most important and useful element of prospect theory

• we should investigate reference points other than the risk-free rate
  – and need a better theory of narrow framing

• we also need a better understanding of “dynamics”
  – e.g. of how past gains and losses affect risk attitudes
The cross-section

*Barberis and Huang (2008)*

- single period model; a risk-free asset and $J$ risky assets with multivariate Normal payoffs
- agents have identical expectations about security payoffs
- agents have identical CPT preferences
  - defined over gains/losses in *wealth* (i.e. no narrow framing)
  - reference point is initial wealth scaled up by the risk-free rate, so utility defined over $\hat{W} = \tilde{W}_1 - W_0 R_f$
  - full specification is:
    \[
    V(\hat{W}) = \int_{-\infty}^{0} v(W) d\pi(P(W)) - \int_{0}^{\infty} v(W) d\pi(1 - P(W))
    \]
    (continuous distribution version of Tversky and Kahneman, 1992)
The cross-section, ctd.

In this economy, the CAPM holds!

- CPT preferences satisfy first-order stochastic dominance (FOSD):
  \[ \hat{W}_1 \text{ FOSD } \hat{W}_2 \Rightarrow V(\hat{W}_1) > V(\hat{W}_2) \]

- under multivariate Normality, the investor’s utility is \( F(\mu_W, \sigma_W^2) \), which, for fixed \( \sigma_W^2 \), is increasing in \( \mu_W \)
  \[ \Rightarrow \text{ investors choose portfolios on the mean-variance efficient frontier} \]

- market clearing \( \Rightarrow \) tangency portfolio is the market portfolio \( \Rightarrow \) CAPM

The cross-section, ctd.

• now introduce a small, independent, positively skewed security into the economy, return $\tilde{R}_n$

• in a representative agent economy with concave EU preferences, the security would earn an average excess return of zero

• we find that, in an economy with CPT investors, the security can earn a negative average excess return
  – skewness itself is priced, in contrast to EU models, where only coskewness matters

• equilibrium involves heterogeneous holdings
  (for now, assume short-sale constraints)
  – some investors hold the old market portfolio and a large, undiversified position in the new security
  – others hold the old market portfolio and no position at all in the new security
  – heterogeneous holdings arise from non-unique global optima, not from heterogeneous preferences
The cross-section, ctd.

• from before, the market return, excluding the new security, is Normally distributed:
  \[ \hat{R}_M \sim N(\mu_M, \sigma_M^2) \]

• give the new security a “lottery-like” binomial distribution:
  \[ \text{payoff} \sim (L, q; 0, 1 - q) \]
  \[ \tilde{R}_n \sim \left( \frac{L}{p_n}, q; 0, 1 - q \right) \]
  – think of \( L \) as large, \( q \) as small

• set values for
  – preference parameters: \( \alpha = 0.88, \lambda = 2.25, \delta = 0.65 \)
  – the risk-free rate, \( R_f = 1.02 \), and the market standard deviation, \( \sigma_M = 0.15 \)
  – the skewed security payoff \( L = 10, q = 0.09 \)

• search for a market risk premium \( \mu_M \) and a price of the skewed security \( p_n \) for which there is a heterogeneous holdings equilibrium
The cross-section, ctd.

- equilibrium condition $V(\hat{R}_M) = 0 \Rightarrow \mu_M = 0.075$
  - i.e. a high equity premium
- equilibrium condition $\sup_{x>0} V(\hat{R}_M + x\hat{R}_n) = 0 \Rightarrow p_n = 0.925$, so that the skewed security earns a negative excess return

$$E(\tilde{R}_n) - R_f = \frac{(0.09)(10)}{0.925} - 1.02 = -0.047$$

Intuition:

- since it contributes skewness to the portfolios of some investors, it is valuable, and so earns a low average return
- not surprising that a CPT investor likes a skewed portfolio
  - more surprising that he likes a skewed security, even if it is small
FIGURE 3. A HETEROGENEOUS HOLDINGS EQUILIBRIUM. Notes: The figure shows the utility that an investor with cumulative prospect theory preferences derives from adding a position in a positively skewed security to his current holdings of a Normally distributed market portfolio. The skewed security is highly skewed. The variable \( x \) is the fraction of wealth allocated to the skewed security relative to the fraction of wealth allocated to the market portfolio. The two lines correspond to different mean returns on the skewed security.
The cross-section, ctd.

• the skewed security only earns a negative excess return if it is *highly* skewed
  – e.g. for $q = 0.15$, there is no heterogeneous holdings equilibrium
  – security can’t contribute enough skewness to overcome lack of diversification

• for moderately skewed securities, there is a homogeneous agent equilibrium
  – here, the expected excess return is zero

• the result that a (highly) positively skewed security earns a negative average excess return holds:
  – even if there are many skewed securities
  – even if short sales are allowed
  – qualitatively, even if expected utility agents are present
FIGURE 4. A HOMOGENEOUS HOLDINGS EQUILIBRIUM. Notes: The figure shows the utility that an investor with cumulative prospect theory preferences derives from adding a position in a positively skewed security to his current holdings of a Normally distributed market portfolio. The skewed security is only moderately skewed. The variable $x$ is the fraction of wealth allocated to the skewed security relative to the fraction of wealth allocated to the market portfolio. The three lines correspond to different mean returns on the skewed security.
FIGURE 5. SKEWNESS AND EXPECTED RETURN. Notes: The figure shows the expected return in excess of the risk-free rate earned by a small, independent, positively skewed security in an economy populated by cumulative prospect theory investors, plotted against a parameter of the security’s return distribution, $q$, which determines the security’s skewness. A low value of $q$ corresponds to a high degree of skewness.
The cross-section, ctd.

Empirical evidence and applications

• several papers test the model’s basic prediction that skewness is priced in the cross-section

  – Zhang (2006) uses returns on stocks similar to stock $X$ to predict the skewness of stock $X$
  – Boyer, Mitton, Vorkink (2010) use a regression model to predict future skewness
  – Conrad, Dittmar, Ghysels (2010) use option prices to infer the perceived (risk-neutral) distribution of the underlying stock

• all three studies find supportive evidence
The cross-section, ctd.

Empirical evidence and applications, ctd.

• low average return on IPOs
  – Green and Hwang (2011) show that IPOs predicted to be more positively skewed have lower long-term returns

• “overpricing” of out-of-the-money options
  – Boyer and Vorkink (2011) find that stock options predicted to be more positively skewed have lower returns

• low average return on stocks with high idiosyncratic volatility (Ang et al., 2006; Boyer, Mitton, Vorkink, 2010)

• low average return on OTC stocks (Eraker and Ready, 2011)

• diversification discount (Mitton and Vorkink, 2008)

• under-diversification
  – Mitton and Vorkink (2010) find that undiversified individuals hold stocks that are more positively skewed than the average stock
The cross-section, ctd.

Remarks:

• an example of how psychology can lead us to useful new predictions

• the model manages to capture both the high and low risk premia we observe
  – skewness, or the lack of it, is key

• alternative framing assumptions?
  – the pricing of skewness should follow even more directly under stock-level narrow framing

• alternative reference points?
  – not clear that the reference point matters very much here
Prospect theory applications

[1]
• the *cross-section of stock returns*
  – one-period models
  – new prediction: the pricing of skewness
  – probability weighting plays the most critical role

[2]
• the *aggregate stock market*
  – intertemporal representative agent models
  – try to address the equity premium, volatility, predictability, and non-participation puzzles
  – loss aversion plays a key role; but probability weighting also matters

[3]
• *trading behavior*
  – multi-period models
  – try to address the disposition effect and other trading phenomena
  – all aspects of prospect theory play a role
can prospect theory help us understand the properties of, and attitudes to, the aggregate stock market?

- e.g. equity premium, volatility, predictability, and non-participation puzzles

Benartzi and Thaler (1995) note that a model in which investors are loss averse over annual changes in their financial wealth predicts a large equity premium

three elements:

- loss aversion
- annual evaluation
- narrow framing

Benartzi and Thaler (1995) emphasize the first two elements

- “myopic loss aversion”

the idea seems to be gaining acceptance
The aggregate stock market, ctd.

Subsequent developments:

• formalizing the argument
• emphasizing the role of narrow framing
• studying the role of probability weighting
• trying to address the volatility puzzle as well
The aggregate stock market, ctd.

**Formalizing the argument**

- to fill out the argument, we need to embed it in the setting where the equity premium is usually studied
  - an intertemporal, representative agent model where consumption plays a non-trivial role
  - e.g. where preferences include a utility of consumption term alongside the prospect theory term

- two ways of doing this:
  - Barberis, Huang, and Santos (2001)
  - Barberis and Huang (2009)

- Barberis and Huang (2008) reviews both methods
The aggregate stock market, ctd.

Formalizing the argument, ctd.

Method I: Barberis, Huang, and Santos (2001)

• intertemporal model; three assets: risk-free \((R_{f,t})\), stock market \((R_{S,t+1})\), non-financial asset \((R_{N,t+1})\)

• representative agent maximizes:

\[
E_0 \sum_{t=0}^{\infty} \left[ \rho^t \frac{C_t^{1-\gamma}}{1-\gamma} + b_0 \rho^{t+1} C_t^{-\gamma} v(G_{S,t+1}) \right]
\]

\[
G_{S,t+1} = \theta_{S,t}(W_t - C_t)(R_{S,t+1} - R_{f,t})
\]

\[
v(x) = \begin{cases} 
  x & \text{for } x \geq 0 \\
  \lambda x & \text{for } x < 0 , \lambda > 1 
\end{cases}
\]

– this assumes narrow framing of the stock market
– and that the reference point is the risk-free rate
– \(v(\cdot)\) captures loss aversion
– we ignore concavity/convexity and probability weighting for now

• for “reasonable” parameters, get a substantial equity premium, although not as large as in Benartzi and Thaler (1995)
The aggregate stock market, ctd.

*Formalizing the argument, ctd.*

Method II: Barberis and Huang (2009)

- start from the standard recursive utility specification
  \[ V_t = H(C_t, \mu(V_{t+1})) \]
  \[ W(C, x) = ((1 - \beta)C^\rho + \beta x^\rho)^{\frac{1}{\rho}}, \ 0 < \beta < 1, \ 0 \neq \rho < 1 \]
  \[ \mu(x) = (E(x^\zeta))^\frac{1}{\zeta} \]

- can adjust this to incorporate narrow framing
  \[ V_t = H \left( C_t, \mu(V_{t+1}) + b_i \sum_i E_t(v(G_{i,t+1})) \right) \]

- in the three asset context from before:
  \[ V_t = H \left( C_t, \mu(V_{t+1}) + b_0 E_t(v(G_{S,t+1})) \right) \]
  \[ G_{S,t+1} = \theta_{S,t}(W_t - C_t)(R_{S,t+1} - R_{f,t}) \]
  \[ v(x) = \begin{cases} x & \text{for } x \geq 0 \\ \lambda x & \text{for } x < 0, \ \lambda > 1 \end{cases} \]
  \[ \zeta = \rho \]
The aggregate stock market, ctd.

Formalizing the argument, ctd.

• this specification is better than Method I
  – it is tractable in partial equilibrium
  – it admits an explicit value function ⇒ easy to check
    attitudes to monetary gambles
  – it does not require aggregate consumption scaling $\bar{C}$

• can now show that for parameter values that predict
  reasonable attitudes to large and small-scale monetary
  gambles, get substantial equity premium
The aggregate stock market, ctd.

The role of narrow framing

• Barberis, Huang, Santos (2001) find that narrow framing is a critical ingredient
  – loss aversion over \textit{total} wealth fluctuations doesn’t produce a significant equity premium
  – the “loss aversion / narrow framing” approach?
  – how do we justify the narrow framing?

The role of probability weighting

• De Giorgi and Legg (2010) bring probability weighting and concavity/convexity into the Barberis and Huang (2009) framework
  – they show that probability weighting can significantly increase the equity premium
  – because the aggregate market is \textit{negatively} skewed
The aggregate stock market, ctd.

The volatility puzzle

• Barberis, Huang, and Santos (2001) also build in dynamic aspects of loss aversion
  – based on evidence in Thaler and Johnson (1990), assume that loss aversion decreases (increases) after past gains (losses)
  – can be interpreted in terms of “capacity for dealing with good or bad news”
  – generates excess volatility in addition to a high equity premium

• more work is needed on how past gains and losses affect risk attitudes
  – amplification seems very important in financial markets, but the mechanisms are unclear
The aggregate stock market, ctd.

• alternative framing assumptions?
  – broad, wealth-level framing does not produce a significant equity premium
  – very narrow stock-level framing produces a larger equity premium than stock market-level framing (Barberis and Huang, 2001)
  – stock market-level framing seems natural here
The aggregate stock market, ctd.

- alternative reference point assumptions?
  
  - both “Method I” and “Method II” allow for reference points other than the risk-free rate

  e.g. Method I

  \[ E_0 \sum_{t=0}^{\infty} \left[ \rho^t \frac{C_t^{1-\gamma}}{1-\gamma} + b_0 \rho^{t+1} C_t^{-\gamma} v(G_{S,t+1}) \right] \]

  \[ G_{S,t+1} = \theta_{S,t}(W_t - C_t)(R_{S,t+1} - R_z) \]

  \[ v(x) = \begin{cases} 
  x & \text{for } x \geq 0 \\
  \lambda x & \text{for } x < 0, \lambda > 1 
  \end{cases} \]

- we can compute the equilibrium equity premium for \( R_z = R_f \) and \( R_z = E(R_S) \)

- in preliminary calculations, we find that, when the reference point is the expected stock return
  
  - the equilibrium equity premium is typically too high (intuition?)
  
  - and is extremely sensitive to the value of \( b_0 \)
  
  - in particular, the model only matches the historical premium for a very narrow range of \( b_0 \)
The aggregate stock market, ctd.
Prospect theory applications

[1]  
• the *cross-section of stock returns*  
  – one-period models  
  – new prediction: the pricing of skewness  
  – probability weighting plays the most critical role

[2]  
• the *aggregate stock market*  
  – intertemporal representative agent models  
  – try to address the equity premium, volatility, predictability, and non-participation puzzles  
  – loss aversion plays a key role; but probability weighting also matters

[3]  
• *trading behavior*  
  – multi-period models  
  – try to address the disposition effect and other trading phenomena  
  – all aspects of prospect theory play a role
Trading behavior

- can prospect theory help us understand how people trade stocks over time?

- a particular target of interest is the “disposition effect”
  - individual investors’ greater propensity to sell stocks trading at a gain relative to purchase price, rather than at a loss

- at first sight, prospect theory, in combination with stock-level narrow framing, appears to be a promising approach

- but it turns out that we need to be careful *how* we implement prospect theory
  - prospect theory defined over annual stock-level trading profits does *not* generate a disposition effect very reliably
  - Barberis and Xiong (2009), “What Drives the Disposition Effect?...”
Trading behavior, ctd.

• consider a simple portfolio choice setting
  – \( T + 1 \) dates: \( t = 0, 1, \ldots, T \)
  – a risk-free asset, gross return \( R_f \) each period
  – a risky asset with an i.i.d binomial distribution across periods:

\[
R_{t,t+1} = \begin{cases} 
R_u > R_f & \text{with probability } \frac{1}{2}, \\
R_d < R_f & \text{with probability } \frac{1}{2},
\end{cases}, \text{ i.i.d.}
\]

• the investor has prospect theory preferences defined over his “gain/loss”
  – simplest definition of gain/loss is trading profit between 0 and \( T \), i.e. \( W_T - W_0 \)
  – we use \( W_T - W_0 R_f^T \)
  – i.e. again, reference point is initial wealth scaled up by the risk-free rate
Trading behavior, ctd.

The investor therefore solves

\[
\max_{x_0, x_1, \ldots, x_{T-1}} E[v(\Delta W_T)] = E[v(W_T - W_0 R_f^T)]
\]

where

\[
v(x) = \begin{cases} 
  x^\alpha & \text{for } x \geq 0 \\
  -\lambda (-x)^\alpha & \text{for } x < 0 
\end{cases}
\]

subject to

\[
W_t = (W_{t-1} - x_{t-1} P_{t-1}) R_f + x_{t-1} P_{t-1} R_{t-1,t} \\
W_T \geq 0
\]

- we are assuming stock-level narrow framing
  - and are ignoring probability weighting
- we can now derive an analytical solution for any number of trading periods
Trading behavior, ctd.

Results

• the investor usually exhibits the opposite of the disposition effect
  – only when $T$ is high and the expected stock return is low does he exhibit a disposition effect
• for $T = 2$ and for the Tversky and Kahneman (1992) parameterization, he always exhibits the opposite of the disposition effect
Trading behavior, ctd.

Why does the disposition effect always fail for the TK parameters in the two-period case? \((t = 0, 1, 2)\)

- for the investor to buy the stock at time 0, in spite of his loss aversion, it must have a high expected return
  - this implies that the time 1 gain is larger than the time 1 loss in magnitude
  - it also implies that, after a time 1 gain, the investor gambles to the edge of the concave region \((v(\cdot)\) is only \textit{mildly} concave over gains\)
  - after a time 1 loss, the investor gambles to the edge of the convex region

- but it takes a \textit{larger} position to gamble to the edge of the concave region after the time 1 gain than it does to gamble to the edge of the convex region after the time 1 loss

\(\Rightarrow\) the investor takes more risk after a gain than after a loss, contrary to the disposition effect
Time 1 and time 2 gains/losses plotted on the value function
Trading behavior, ctd.

- alternative framing assumptions?
  - stock-level framing seems reasonable
  - the predictions of broader framing have not been worked out

- alternative reference points?
  - a very promising direction
  - e.g. Meng (2011) suggests that a reference point higher than the risk-free rate may make it easier to predict a disposition effect
Trading behavior, ctd.

Other approaches to explaining the disposition effect?

- one idea is to apply prospect theory to *realized* gains and losses (Shefrin and Statman, 1985)
  - i.e. to assume “realization utility”
- e.g. if you buy a stock at $40 and sell it at $60
  - you get a burst of positive utility *at the moment of sale*, based on the size of the realized gain
- prospect theory applied to realized gains and losses *does* predict a disposition effect more reliably (Barberis and Xiong, 2009)
- what is the source of realization utility?
  - people often think about their investing history as a series of investing episodes
  - and they think of selling a stock at a gain (loss) as a “good” (“bad”) episode
  ⇒ when an investor sells an asset at a gain, he feels a burst of pleasure because he is creating a positive new investing episode
Trading behavior, ctd.

• Barberis and Xiong (2010), “Realization Utility,” study linear realization utility, coupled with a positive time discount factor
  – the investor derives utility from the sale price of an asset minus the purchase price scaled up by the risk-free rate
• look at both portfolio choice and asset pricing
• if the expected stock return is high enough, the investor’s optimal strategy is to buy a stock at time 0
  – and to sell it only if its value rises a certain percentage amount above the (scaled up) purchase price
  – he then immediately invests the proceeds in another stock, and so on
• for some parameter values, the investor is risk-seeking
Trading behavior, ctd.

• applications:
  – the disposition effect

but also:
  – “excessive trading”
  – the underperformance of individual investors even before transaction costs
  – the greater turnover in bull markets
  – the greater selling propensity above historical highs
  – the individual investor preference for volatile stocks
  – the negative premium to volatility in the cross-section
  – the fact that overpriced assets are also heavily traded
  – momentum
Trading behavior, ctd.

• alternative framing assumptions?
  – realization utility fits most naturally with asset-level framing

• alternative reference points?
  – can be studied in our framework

Note:

• neural data offer some support for realization utility
  – Frydman, Barberis, Camerer, Bossaerts, Rangel (2011)
Trading behavior, ctd.

Summary

• a model in which the investor derives prospect theory utility from annual trading profits does not deliver a disposition effect very reliably

• a model in which the investor derives prospect theory utility from realized gains and losses delivers a disposition effect more reliably
  – but the disposition effect follows even from linear realization utility, coupled with a positive time discount factor

Note:

• the annual trading profit model may not be dead (Meng, 2011)

• the trading models we have seen ignore probability weighting
  – in dynamic settings, probability weighting leads to a time inconsistency that may be important in some contexts
  – e.g. in casinos (Barberis, 2011)
Summary

• the *cross-section of stock returns*
  – one-period models
  – new prediction: the pricing of skewness
  – probability weighting plays the most critical role
  – no narrow framing needed

• the *aggregate stock market*
  – intertemporal representative agent models
  – try to address the equity premium, volatility puzzles
  – loss aversion plays a key role; but probability weighting also matters
  – typically assume stock market-level narrow framing

• *trading behavior*
  – multi-period models
  – try to address the disposition effect and other trading phenomena
  – all aspects of prospect theory play a role
  – typically assume stock-level narrow framing
Themes

• prospect theory seems to be quite helpful for thinking about financial phenomena
  – particularly a model that applies prospect theory to gains and losses in financial wealth

• for finance applications, probability weighting may be the most important and useful element of prospect theory

• we need to investigate reference points other than the risk-free rate
  – and to think harder about narrow framing

• finally, we need a better understanding of dynamics
  – how past gains and losses affect risk attitudes