Expectations Data in Asset Pricing

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- The market prices of assets reflects investors' price and payout expectations
- The traditional approach to asset pricing is to assume rational expectations
  - → expectations are objective
  - → Price swings are attributed to risk premium changes rather than expectations
- A growing literature examines whether RE difficulties could be addressed by allowing subjective beliefs.
  - → how subjective beliefs are formed
  - → expectation survey data

A general asset pricing framework

- An asset with stochastic payout stream D_t, price P_t
- 3 elements to price:
  - Marginal agents $\{\mathcal{M}_t\}_{t=0}^{\infty}$ $\rightarrow$ determined by belief heterogeneity and portfolio constraints
  - One-step-ahead SDF $\{M_{t+1}^m\}_{t=0}^{\infty}$
  - This marginal agent's subjective probability measures $\mathcal{P}_t^m$ $\rightarrow$ how to form

$$P_t = E_t^m[M_{t+1}^m(P_{t+1} + D_{t+1})]. \tag{1}$$

$$M_{t+1}^m = \delta_t^m \xi_{t+1}^m, \qquad \text{where} \quad E_t^m[\xi_{t+1}^m] = 1 \tag{2}$$

  - δ_t^m controls the conditional mean of the SDF, ξ_{t+1}^m captures the variation

$$P_t = \delta_t^m E_t^m[D_{t+1} + P_{t+1}] + \delta_t^m \operatorname{cov}_t^m(D_{t+1} + P_{t+1}, \xi_{t+1}^m). \tag{3}$$

- For the risk-free asset:

$$\frac{1}{R_{f,t}} = \delta_t^m \qquad \delta_t^m = \delta_t.$$

- Finally simplifies to:

$$P_t = \delta_t E_t^m[D_{t+1} + P_{t+1}] + \delta_t \operatorname{cov}_t^m(D_{t+1} + P_{t+1}, \xi_{t+1}^m).$$

Subjective expectations discounted with the conditional mean of SDF

Subjective risk premium

$$R_{t+1} = (P_{t+1} + D_{t+1})/P_t$$

$$E_t^m[R_{t+1}] - R_{f,t} = -\operatorname{cov}_t^m(R_{t+1}, \xi_{t+1}^m).$$

Rational expectations

- Objective expectation:

information

$$E_t^m[D_{t+1} + P_{t+1}] = E[D_{t+1} + P_{t+1}|\mathcal{J}_t] \text{ for all } t \geq 0, \tag{8}$$

- Implies:

$$E[R_{t+1}|\mathcal{J}_t] - R_{f,t} = -\operatorname{cov}(R_{t+1}, \xi_{t+1}^m|\mathcal{J}_t), \tag{9}$$

  - the risk premium must be the same for all marginal agents.
  - → econometrician can approximate the risk-premium as :

$$-\operatorname{cov}(R_{t+1}, \xi_{t+1}^m|\mathcal{A}_t) = E[R_{t+1}|\mathcal{A}_t] - R_{f,t}. \tag{10}$$

Subjective beliefs in a single period

$$P_t = \delta_t E_t^m[D_{t+1}] + \delta_t \operatorname{cov}_t^m(D_{t+1}, \xi_{t+1}^m). \tag{11}$$

- A risky asset with a maturity of one period, pay D_{t+1} in $t+1$

- **Homogeneous subjective beliefs**
  - Same subjectively required risk premium → have to adjust portfolios
  - Notice: subjective risk premium ≠ objective risk premium

$$E[R_{t+1}|\mathcal{A}_t] - R_{f,t} = E_t^m[R_{t+1}] - R_{f,t} + \frac{E[D_{t+1}|\mathcal{A}_t] - E_t^m[D_{t+1}]}{P_t}. \tag{12}$$

$$P_t = \delta_t E_t^m [D_{t+1}] + \delta_t \operatorname{cov}_t^m (D_{t+1}, \xi_{t+1}^m). \tag{11}$$

- **Heterogeneous subjective beliefs**
  - Heterogeneity in subjective risk premia
  - Greater expectation must have higher risk premium so they agree on same price
  - Beliefs vary over time, then their risk exposure and risk premia vary over time as well.

Subjective beliefs in a multi-period setting

- Capital gain: $\beta^P_{t+1} \equiv P_{t+1}/P_t$
- Subjectively expected excess return:

$$E^m_t\left[\frac{P_{t+1}+D_{t+1}}{P_t}\right] - R_{f,t} = E^m_t[\beta^P_{t+1}] + \frac{E^m_t[D_{t+1}]}{P_t} - \frac{1}{\delta_t}. \qquad (14)$$

Expected capital gains — payouts — Risk-free rate

- Equilibrium price:

$$P_t = \frac{E^m_t[D_{t+1}]}{\frac{1}{\delta_t} - \mathrm{cov}^m_t(\xi^m_{t+1}, R_{t+1}) - E^m_t[\beta^P_{t+1}]}. \qquad (15)$$

- **Common knowledge**
  - Common on the asset price and SDF
  - To simplify, we consider a setting with risk-neutral marginal agents, which have the same constant SDF over time:

$$M_{t+1}^m = \delta \in (0,1) \text{ for all } t \geq 0. \tag{16}$$

  - Iterate forward on the market price

$$P_t = \delta E_t^m[D_{t+1}] + \delta^2 E_t^m[E_{t+1}^m[D_{t+2}]] + \delta^3 E_t^m[E_{t+1}^m[E_{t+2}^m[D_{t+3}]]] \dots \tag{17}$$

    - Law of Iterated expectations $E_t^m[E_{t+1}^m[D_{t+2}]] = E_t^m[D_{t+2}]$.

$$P_t = \delta E_t^m[D_{t+1} + \delta D_{t+2} + \delta^2 D_{t+3} + \dots.]. \tag{19}$$

- **Lack of common knowledge**
  - 1 explicitly model the higher-order payout expectations.
  - 2 directly model the subjective first-order capital gains expectations
  - → higher freedom degree

Empirical dynamics of investor expectations

- → Researchers must make additional assumptions about **how agents form beliefs.**

- Return and price expectations
  - **Focus on expectations of returns and price levels of aggregate stock market indices/subjective risk premium.**
  - Expectation of stock market returns ~ past returns/life-time market returns (UBS/Gallup survey) → experience
  - Expected stock market capital gains ~ the price-dividend ratio

- Which groups these surveys represent?
  - Professional investors are not covered
  - Professional investors' expectations are acyclical or countercyclical.
  - → professionals' expectations may be closer to the RE benchmark

- Cash flow expectations
  - Contain more info than return, provide how subjective belief dynamics generate asset price volatility.
  - Relatively small number of studies
  - Available evidence: surveys of professional forecasters and from aggregated firm-level earnings or dividend forecasts, but no cash flow, and not a full term structure.
    - Use aggregated equity analyst earnings forecast to measure subjective cash flow
    - ……
  - → asset price fluctuations reflect variation in investors' subjective cash flow growth expectations.

- Interest rate expectations
  - Consider a zero-coupon bond with a sure payoff $1 at t+2

$$P_t = \frac{1}{R_{f,t}} E_{t+1}^m \left[\frac{1}{R_{f,t+1}} \right]. \qquad (22)$$

  - Long-term bond excess returns are predictable with bond spreads, which could be a consequence of predictable forecast errors, instead of risk aversion in RE.

- Subjective risk perceptions
  - Subjective perceptions of second and higher moments are also relevant
  - Could be the driver of empirically observed time-varying risk premia.
    - Graham and Harvey CFO survey: ask the 10^{th} and 90^{th} percentile of stock returns over the next year
    - Yale/ICF survey : subjective probabilities of a stock market crash over the next 6M
    - $\rightarrow$ investors' stock market risk perceptions seems to be slowly moving

Mapping survey expectations into asset pricing models

- Are survey expectations risk adjusted?
  - Cochrane (2011) suggests that individuals might report expectations under the risk-neutral measure and that this could help explain the large wedges between survey expectations and investor expectations implied by rational expectations asset pricing models.
  - Risk preference effects could distort responses to expectations.

$$\mathcal{E}_t^i[R_{t+1}] = E_t^i\left[\frac{M_{t+1}^i}{E_t^i[M_{t+1}^i]}R_{t+1}\right]$$

  - Empirical results show that they are reporting without risk-adjustments.

- Measurement error and cognitive uncertainty

$$\mathcal{E}_t^i[R_{t+1}] = E_t^i[R_{t+1}] + \varepsilon_{t+1}^i.$$

  - Survey return expectations contain useful information about individuals' $E_t^i[R_{t+1}]$, but the error is not negligible.
  - The portfolio share of stocks in individuals' portfolios is substantially less sensitive to individuals' stock market return expectations

- Heterogeneity and belief aggregation
  - Which individual beliefs in the survey should represent agents?
  - Equally-weighted mean or median
  - Explicitly specify belief heterogeneity

Models of expectation formation

- → investors use observed data to form expectations about future payouts or prices. (most use a homogeneous-belief setup)
- Learning about payouts
- Learning about prices
  - Price beliefs affect price outcomes and price outcomes future revisions in price beliefs.
- Learning bias
- Heterogeneity
  - Still in infancy

Future research directions

- More evidence on the links between expectations and investor portfolio decisions.
- Subjective risk perception and asset pricing
- Heterogeneity in the subjective beliefs of different groups.
- How to best aggregate the heterogeneous expectations
- Subjective belief dynamics
- Analysis of policy in models.

Investor Survey Data Sets

Survey	Population	Repository
Panel A: Stock market return or capital gain expectations		
UBS/Gallup	Individuals	Roper Center[1]
Yale/ICF	Wealthy individuals	Yale ICF[2]
Yale/ICF	Institutional investors	Yale ICF[2]
Michigan Survey of Consumers	Individuals	UM Survey Research Center[3]
Graham-Harvey CFO	Financial managers	FRB of Richmond[4]
Livingston	Professional forecasters	FRB of Philadelphia[5]
Panel B: Stock market cash flow expectations		
IBES	Equity Analysts	WRDS[6]
Survey of Professional Forecasters	Professional forecasters	FRB of Philadelphia[7]
Panel C: Interest rate expectations		
Survey of Professional Forecasters	Professional forecasters	FRB of Philadelphia[7]
Bluechip Financial Forecasts	Professional forecasters	Wolters Kluwer[8]

[1]https://ropercenter.cornell.edu

[2]https://som.yale.edu/centers/international-center-for-finance/data

[3]https://data.sca.isr.umich.edu

[4]https://www.richmondfed.org/cfosurvey

[5]https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/livingston-survey

[6]https://wrds-www.wharton.upenn.edu

[7]https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/
survey-of-professional-forecasters

[8]https://www.wolterskluwer.com/en/solutions/vitallaw-law-firms/blue-chip