Do Survey Expectations of Stock Returns Reflect Risk-Adjustments?

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- use survey expectations data to replace expectations assumptions
- empirically disciplined way to consider alternatives to REH
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Expanding use of survey expectations of stock returns in asset pricing

- Vissing-Jorgensen (2003), Bacchetta, Mertens & Wincoop (2009), Malmendier & Nagel (2011), Greenwood & Shleifer (2014)

Survey Expectations and Stock Price Theories

Time-series of survey expectations of stock returns $\neq$ predictions of RE asset pricing models

- Greenwood & Shleifer (2014); Adam, Marcet & Beutel (2017), and others
- e.g., expectations overly optimistic/pessimistic when PD-ratio is high/low

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Interpretation?

- Do RE asset pricing models get something fundamentally wrong?
- Or is the problem that preferences/risk-adjustments distort the expectations reported in surveys?

Distorted Survey Expectations

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H_0 : survey expectations implied by risk-neutral beliefs

- *"If people report the risk-neutral expectation, then many surveys make sence [sic.]"* AFA Presidential Address by Cochrane (2011)

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   - agents with preference for robustness act *as if* they had pessimistic beliefs (Hansen & Sargent (2001))
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This paper: Examine empirical validity of these hypotheses

- derive sharp predictions from asset pricing theory
- test on multiple surveys of U.S. stock market expectations

Risk-Neutral Expectations: Testable Implication

- If survey expectations $\mathcal{E}_t^i[R_{t+1}]$ reflect risk-neutral beliefs

$$\mathcal{E}_t^i[R_{t+1}] = \mathbb{E}_t^{\mathcal{P}^i}\left[\frac{m_{t+1}^i}{\mathbb{E}_t^{\mathcal{P}^i}[m_{t+1}^i]} R_{t+1}\right] + \varepsilon_t^i.$$

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- Using first-order condition of investor i with frictionless access to stock and bond market

$$1 = \mathbb{E}_t^{\mathcal{P}^i}[m_{t+1}^i R_{t+1}],$$
$$1 = \mathbb{E}_t^{\mathcal{P}^i}[m_{t+1}^i] R_t^f.$$

we get testable implication

$$\mathcal{E}_t^i[R_{t+1}] = R_t^f + \varepsilon_t^i.$$

  - Holds for each individual investor i, thus for mean/median investor.

Risk-Neutral Expectations: Tests

- Null hypothesis of risk-neutral returns expectations
  Unconditional test $\mathrm{H}_0: \; a = 0$, where

$$\mathcal{E}_t[R_{t+1}] - R_t^f = a + \varepsilon_t,$$

  Conditional test $\mathrm{H}_0: \; a = 0 \wedge b = 0$, where

$$\mathcal{E}_t[R_{t+1}] - R_t^f = a + b^{'}\mathrm{x}_t + \varepsilon_t,$$

  $\mathcal{E}_t[R_{t+1}]$ and ε_t: cross-sectional means (medians) of survey returns expectations, $\mathcal{E}_t^i[R_{t+1}]$, and measurement errors, ε_t^i.

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- No need for assuming rational risk-neutral expectations ($\mathcal{P}^i \equiv \mathcal{P}^{\mathrm{RE}}$)
- Rejection of H_0 implies non-existence of any (internally rational) probability measure consistent with risk-neutral return hypothesis

Stock Return Expectations Survey Data

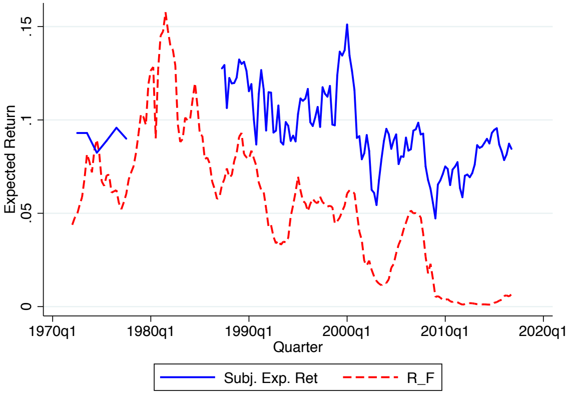
- Duke CFO Global Business Outlook 2000q3 – 2016q1
- UBS/Gallup Survey 1999m2 – 2003m4 / 2007m10
- Combined surveys in Nagel and Xu (2018) 1987m6 – 2016m12
  - UBS/Gallup
  - Conference Board
  - Michigan Survey of Consumers
- Investor Behavior Project at Yale (Robert Shiller) 1999m1 – 2015m8
  - forecast horizon: 3 and 6 months, 1 and 10 years

Market Data

- Risk-free interest rates
  - 3- and 6-months: U.S. T-bill yields from FRED
  - 1- and 10-years: U.S. zero-coupon Treasury yield curve dataset by Gürkaynak, Sack & Wright (2007 + subsequent updates)
  - 1-year adjustable mortgage rate from FRED

- Stock market data
  - S&P500 price and total return indices
  - DJIA price and total return indices
  - CRSP value-weighted price and total return indices

Risk-Neutral Hypothesis: Survey Expectations Compared with Risk-Free Rate



Source: Subjective expected return = one-year expected stock market returns from various individual investor surveys in Nagel and Xu (2018). R_F = one-year Treasury yield

Test RN-U: $\mathcal{E}_t[R_{t+1}] - R_t^f = a + \varepsilon_t$

Survey Source		$\hat{a}$	t-stat	p-value $H_0\colon a = 0$
CFO		3.89	9.47	0.0000
UBS, own	all	6.55	12.53	0.0000
	>100k	6.40	12.36	0.0000
UBS, market	all	6.64	13.31	0.0000
	>100k	6.36	12.29	0.0000
UBS	extended	5.80	20.10	0.0000
Shiller, individual	3-months	1.00	4.71	0.0000
	6-months	2.29	7.98	0.0000
	1-year	5.02	9.26	0.0000
	10-years	8.90	2.34	0.0194
Shiller, professional	3-months	0.68	2.28	0.0223
	6-months	2.16	3.82	0.0001
	1-year	5.24	5.23	0.0000
	10-years	42.47	10.79	0.0000

Test RN-C: $\mathcal{E}_t[R_{t+1}] - R_t^f = a + b(P_t/D_t) + \varepsilon_t,$

Survey source		$\hat{a}$	$\hat{b} \cdot 10^3$	**p-value** $H_0: a = b = 0$	**p-value** $H_0: b = 0$
CFO		-1.39	8.66	0.0044	0.2307
UBS,	all	1.09	6.57	0.0000	0.0589
own	$>$100k	0.02	7.86	0.0000	0.0302
UBS,	all	-0.52	7.96	0.0000	0.0059
market	$>$100k	-1.72	9.00	0.0000	0.0148
UBS	extended	2.24	5.79	0.0000	0.0002
Shiller,	3-months	0.03	1.95	0.0029	0.4759
individual	6-months	2.61	-0.47	0.0000	0.8115
	1-year	10.46	-9.77	0.0000	0.0141
	10-years	34.51	-50.86	0.9759	0.4601
Shiller,	3-months	4.26	-6.45	0.0005	0.0068
professional	6-months	9.48	-13.20	0.0000	0.0001
	1-year	19.51	-25.89	0.0000	0.0052
	10-years	83.88	-76.17	0.0000	0.0844

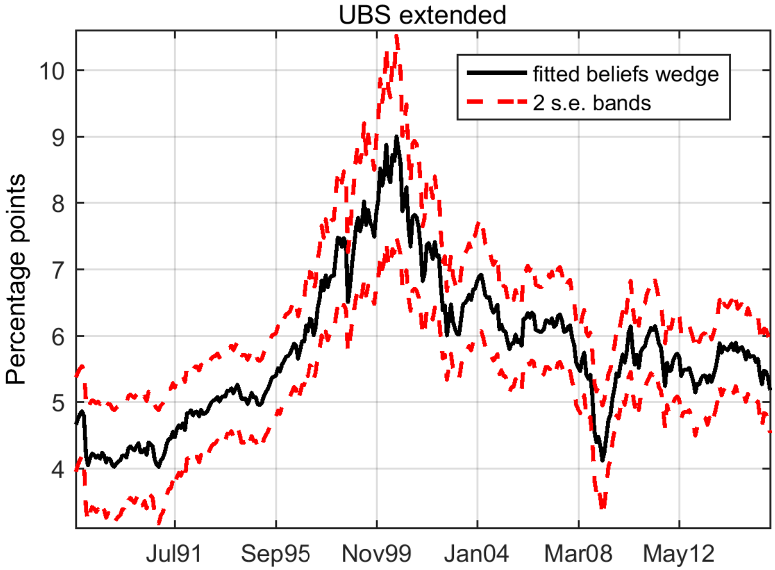


Figure: Estimated subjective conditional expected excess return

$$\left(\mathcal{E}_t[R_{t+1}] - R_t^f\right)^{\wedge} = \hat{a} + \hat{b}(P_t/D_t)$$

Risk-Neutral Hypothesis: Concerns

Presence of trading restrictions:

- short-sale constraint on stock market $\mathcal{E}_t^i[R_{t+1}] < R_t^f + \varepsilon_t^i$
- borrowing constraint on bond market $\mathcal{E}_t^i[R_{t+1}] > R_t^f + \varepsilon_t^i$

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Wedge between borrowing and lending rates:

- Treasury rates may be flawed proxies of risk-free rates
- Robustness check: 1-year adjustable mortgage rate
- Collateralized rate to avoid contamination by credit spreads

Pessimism Hypothesis

- Survey expectations $\mathcal{E}_t^i[R_{t+1}]$ implied by pessimistic beliefs

$$\mathcal{E}_t^i[R_{t+1}] = \mathbb{E}_t[q_{t+1}^i R_{t+1}] + \varepsilon_t^i.$$

where q_{t+1}^i is a belief distortion factor $E_t[q_{t+1}] = 1$

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$$\begin{aligned}\mathcal{E}_t^i[R_{t+1}] &= \mathbb{E}_t[R_{t+1}] + \mathrm{cov}(q_{t+1}^i, R_{t+1}) + \varepsilon_t^i \\ &< \mathbb{E}_t[R_{t+1}] + \varepsilon_t^i\end{aligned}$$

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- Measurement of $\mathbb{E}_t[R_{t+1}]$?

Pessimism Hypothesis: Proxies for $\mathbb{E}_t[R_{t+1}]$

1 Realized returns R_{t+1}

$$R_{t+1} = \mathbb{E}_t[R_{t+1}] + \eta_{t+1}$$

- R_{t+1} can diverge from $\mathbb{E}_t[R_{t+1}]$ over extended period of time
- can be a problem for testing surveys with short length
- $\mathcal{E}_t[R_{t+1}]$ may come out on average below R_{t+1} due to sampling error

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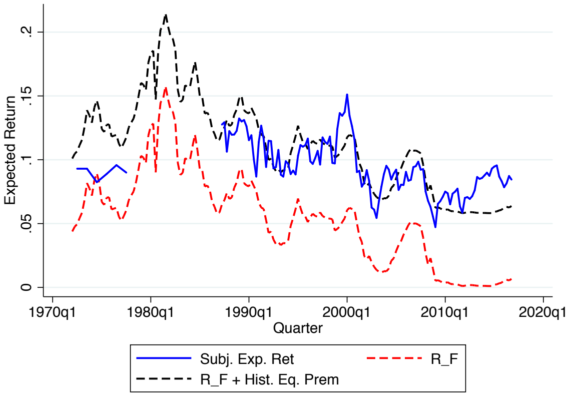
2 Fitted values from predictive regression $\hat{\mathbb{E}}_t[R_{t+1}]$

$$R_{t+1} = k_0 + k_1^{'} \mathrm{z}_t + u_t \tag{1}$$

- more precise than realized returns over short period of time
- further improve precision by running (1) on longer series
- std. errors in test regressions require generated-regressor adjustment

Pessimism Hypothesis: Survey Expectations Compared with Risk-Free Rate + Hist. Equity Premium



Source: Subjective expected return = one-year expected stock market returns from various individual investor surveys in Nagel and Xu (2018). R_F = one-year Treasury yield. Historical equity premium: Average return of CRSP value-weighted index in excess of one-year Treasury yield 1926-2016.

Test PE-U1: $\mathcal{E}_t[R_{t+1}] - R_{t+1} = a + e_t - \eta_{t+1}$

Survey Source		$\hat{a}$	t-stat	p-value $H_0: a \leq 0$
CFO		-1.61	-0.43	0.6663
UBS, own	all	7.59	1.62	0.0526
	$>$100k	7.44	1.59	0.0558
UBS, market	all	13.97	2.07	0.0193
	$>$100k	13.69	2.01	0.0222
UBS extended		-1.86	-0.72	0.7636
Shiller, individual	3-months	-0.55	-0.68	0.7513
	6-months	-0.01	-0.01	0.5030
	1-year	0.52	0.17	0.4323
	10-years	11.53	0.50	0.3088
Shiller, professional	3-months	-0.59	-0.62	0.7334
	6-months	-0.08	-0.05	0.5181
	1-year	0.58	0.20	0.4218
	10-years	43.18	2.27	0.0115

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Test PE-U2: $\mathcal{E}_t[R_{t+1}] - \hat{\mathbb{E}}_t[R_{t+1}] = a + e_t + \omega_t$

Survey Source		$\hat{a}$	**t-stat**	**p-value** $H_0: a \leq 0$
CFO		-0.60	-0.37	0.6425
UBS, own	all	7.09	2.79	0.0026
	>100k	6.94	2.73	0.0031
UBS, market	all	9.84	3.17	0.0008
	>100k	9.55	3.06	0.0011
UBS extended		2.10	1.06	0.1454
Shiller, individual	3-months	-0.51	-1.01	0.8428
	6-months	-0.61	-0.69	0.7548
	1-year	0.28	0.18	0.4290
	10-years	8.26	0.48	0.3158
Shiller, professional	3-months	-0.83	-1.69	0.9542
	6-months	-0.74	-0.86	0.8044
	1-year	0.31	0.22	0.4118
	10-years	40.35	2.77	0.0028

Test PE-C1: $\mathcal{E}_t[R_{t+1}] - R_{t+1} = a + b(P_t/D_t) + e_t - \eta_{t+1}$

Survey source		Reject pessimism	Reject optimism
CFO		0.1212	0.1667
UBS, own	all	0.3504	0.0256
	>100k	0.3504	0.0256
UBS, market	all	0.8889	0.0000
	>100k	0.4444	0.0000
UBS extended		0.1563	0.3125
Shiller, individual	3-months	0.1692	0.5538
	6-months	0.2154	0.2154
	1-year	0.1846	0.2154
	10-years	0.1077	0.1077
Shiller, professional	3-months	0.1231	0.4000
	6-months	0.1846	0.2308
	1-year	0.1846	0.0308
	10-years	0.2615	0.3077

Test PE-C2: $\mathcal{E}_t[R_{t+1}] - \hat{\mathbb{E}}_t[R_{t+1}] = a + b(P_t/D_t) + e_t + \omega_t$

Survey source		**Reject pessimism**	**Reject optimism**
CFO		0.0968	0.2258
UBS, own	all	0.3714	0.0000
	>100k	0.3429	0.0000
UBS, market	all	0.5686	0.0000
	>100k	0.5294	0.0196
UBS extended		0.1335	0.1278
Shiller, individual	3-months	0.0000	0.2769
	6-months	0.0000	0.2615
	1-year	0.0462	0.1538
	10-years	0.2286	0.4857
Shiller, professional	3-months	0.0000	0.0769
	6-months	0.0000	0.0000
	1-year	0.0000	0.0000
	10-years	0.4571	0.0000

Conclusion

Rejected: survey expectations under risk-neutral probability measure

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Observed subjective belief dynamics are a serious challenge for asset pricing

- Key: predictable subjective expectations errors
- Non-RE asset pricing theories needed to generate observed belief dynamics

  Barberis et al. (2015), Adam et al. (2016,2017), Nagel and Xu (2018)