

Demand-based Expected Returns

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The Paper in short

Idea: Use investors' portfolios to characterize their subjective expected returns

Pipeline

1. Theoretical framework to recover subjective beliefs through holdings data and option prices
2. Empirically test on 30-days option portfolios of Customers and Market Makers

Results

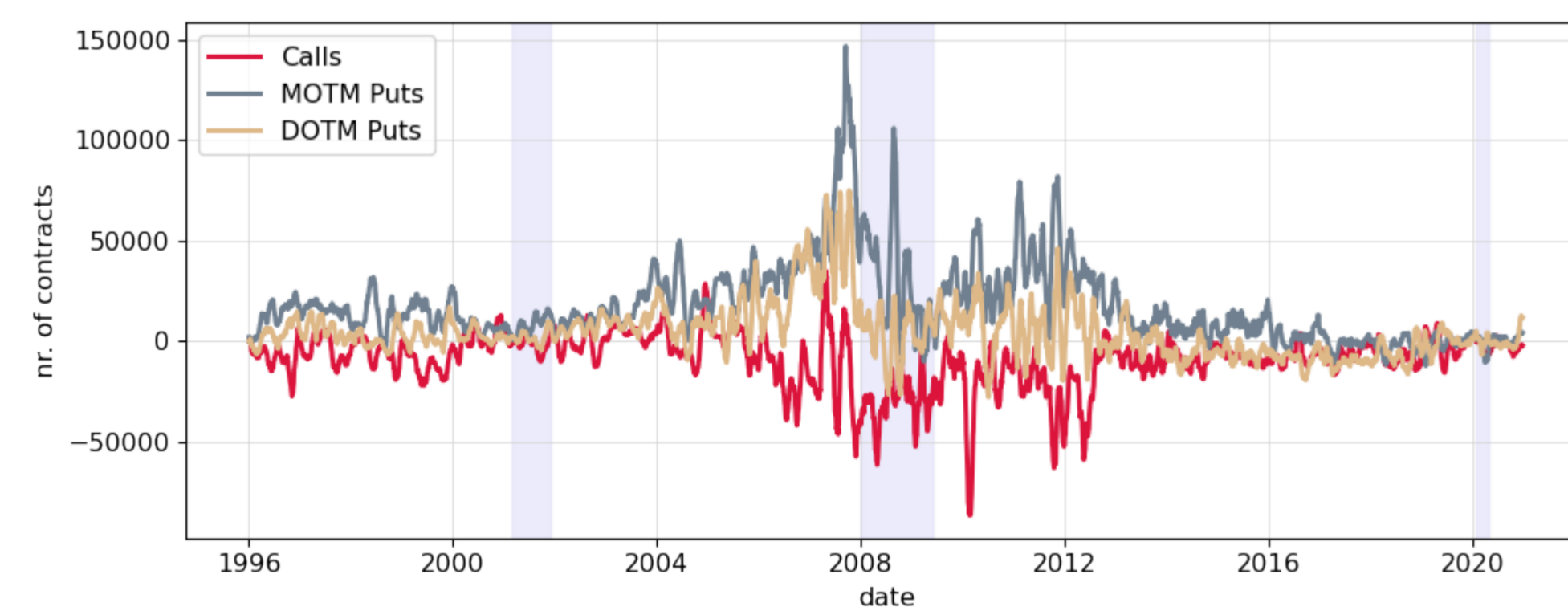
1. Rationale to explain statistical properties of subjective expected returns
2. Customers: volatile, even negative, a-cyclical, in line with survey data
3. Market Makers: positive, counter-cyclical, aligned to price-based measures

Subjective Expected Returns

$$\mathbb{E}_t^i[R] = \mathbb{E}_t^*[\theta'_i \mathbf{R}R] = \theta_{mkt} \text{Var}_t^*(R) + \theta'_{opt} \text{Cov}_t^*(\mathbf{R}_{opt}, R) + 1$$

- Unconstrained investors with heterogeneous beliefs
- Lower bound for subjective expected returns (exact if agents have log utility)
- Data-driven, real-time recovery
- Covariance term may be positive/negative, pro-/counter-/a-cyclical → rich variety of features captured by demand effects

Empirics



- CBOE data: Customers' and Market Makers' daily positions in OTM options
- Portfolio structure: θ_0 in S&P500, $1 - \theta_0$ in OTM calls and puts, the rest in risk-free

$$\theta_0 = \theta_0^{min} + \alpha \cdot (1 - \theta_0^{min})$$

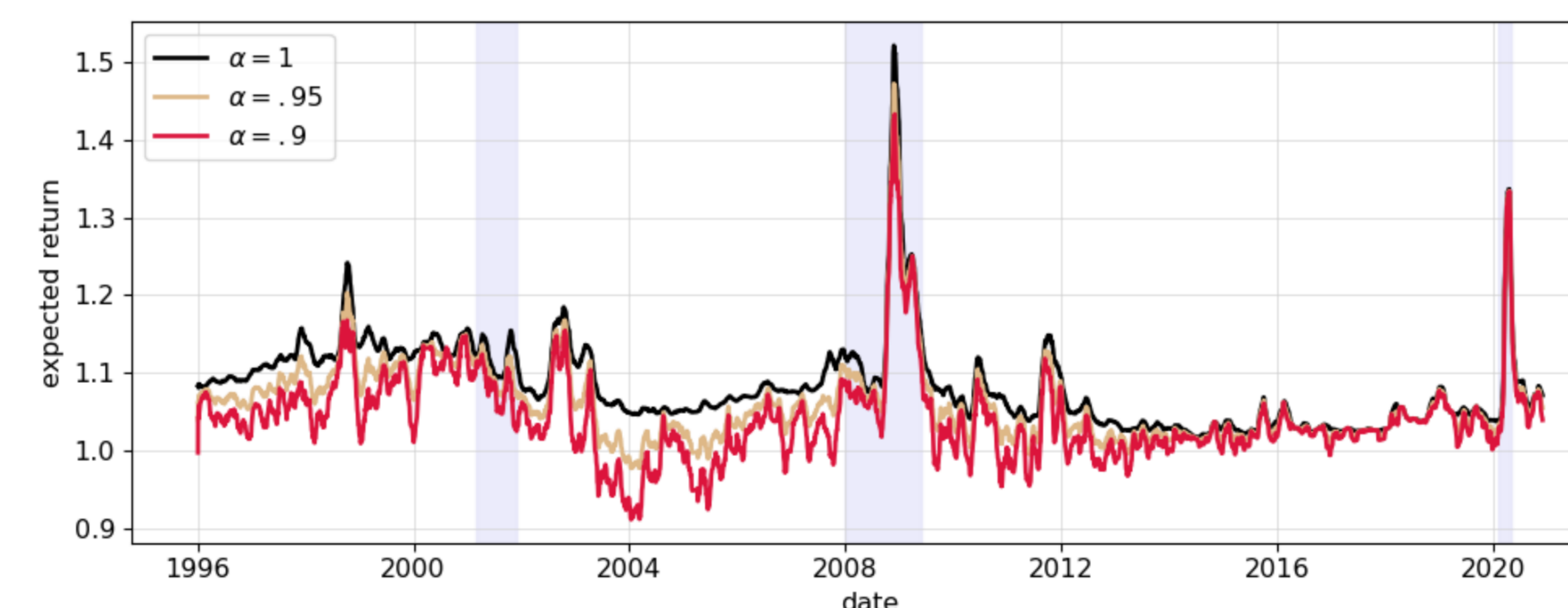
- Customers hold index + long OTM puts + short OTM calls
- Market Makers hold/sell index + short OTM puts + long OTM calls + negative Δ -hedging (the rest in risk-free)
- Investors' positions in options depend on aggregation pattern across maturity and moneyness

Customers vs. Market Makers

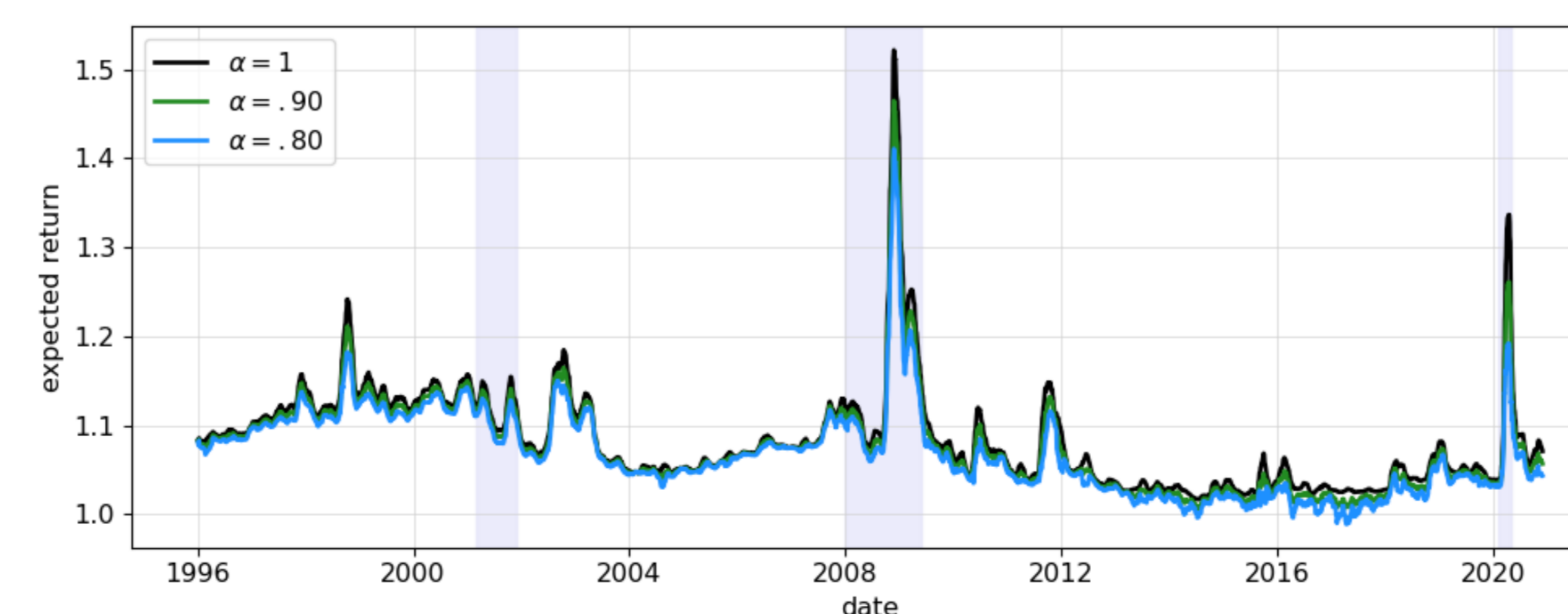
- Customers' "pessimistic" view : options-induced belief distortion is negative, volatile, not persistent, a-cyclical
- Market Makers' Δ -hedged positions neutralize the first order covariance correction : large, positive, counter-cyclical expected returns
- ...but Market Makers' subjective expectations are spuriously "optimistic" as they are *constrained* investors

	α	mean	std	min	median	max	corr (%)	AR(1)	index (%)
Customers									
1	1.082	0.058	1.017	1.069	1.521	100	0.82	100	
90%	1.041	0.058	0.911	1.032	1.433	85	0.69	97	
80%	1.004	0.071	0.792	1.006	1.366	59	0.58	94	
50%	0.913	0.124	0.520	0.933	1.337	20	0.51	86	
0	0.810	0.194	0.258	0.838	1.345	5	0.49	72	
Market Makers									
1	1.082	0.058	1.017	1.069	1.521	100	0.82	100	
90%	1.074	0.053	1.006	1.065	1.465	99	0.85	86	
80%	1.045	0.049	0.989	1.059	1.410	97	0.87	72	
50%	1.045	0.043	0.936	1.043	1.262	78	0.86	30	
0	1.012	0.048	0.779	1.021	1.104	29	0.69	-40	

Customers

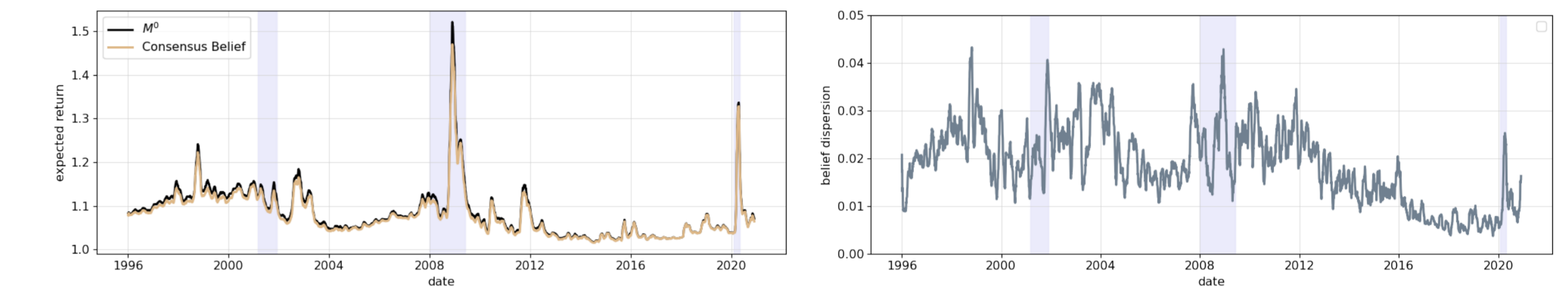


Market Makers



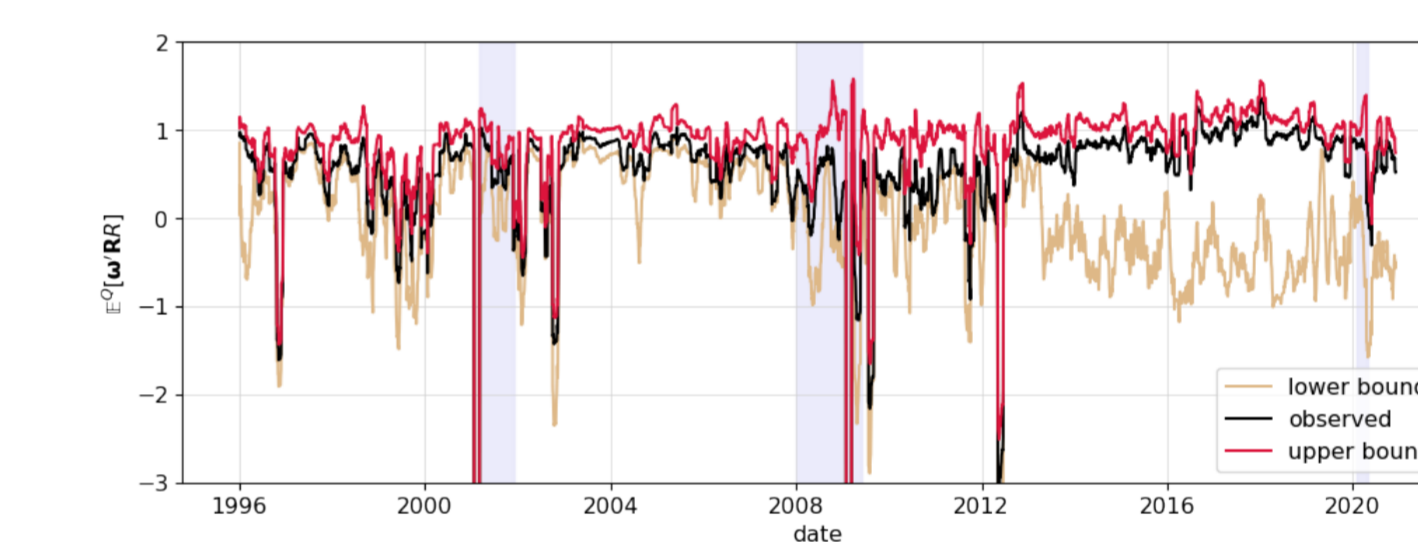
Applications

What is the implicit Market View?



- Consensus Belief = $\sum_i w_i \mathbb{E}^i[R]$ reflects the aggregate expected return across unconstrained investors. Options are redundant only if every market participant is unconstrained
- Belief Dispersion = $\sum_i w_i |\mathbb{E}^i[R] - CB|$ the belief heterogeneity degree in the market

What if Holdings have Measurement Errors?



Solve for the portfolio supporting the minimum (or maximum) subjective expected return, while being compatible with the observed belief

$$\min_{\theta} \left\{ \mathbb{E}_t^*[\theta' \mathbf{R}R] + \lambda \left(\frac{1}{2} \|\theta - \theta^*\|_2^2 - \delta \right) \right\}$$

Subjective Measures of Risk

α	Customers' subj. Volatility						Customers' subj. Sharpe Ratio					
	mean	std	min	median	max	corr (%)	mean	std	min	median	max	corr (%)
1	0.221	0.104	0.094	0.190	0.934	91	0.226	0.068	0.124	0.218	0.523	76
90%	0.253	0.103	0.093	0.244	0.931	86	0.060	0.134	-0.351	0.790	0.483	36
80%	0.269	0.105	0.091	0.265	0.919	81	-0.054	0.200	-0.821	-0.016	0.481	17
50%	0.286	0.110	0.087	0.279	0.872	72	-0.341	0.390	-1.517	-0.269	0.477	-4
0	0.281	0.133	0.210	0.260	1.221	57	-0.912	0.850	-3.623	-0.733	0.476	-17

How do Holdings affect SDFs?

