Characteristics of Mutual Fund Portfolios: Where Are the Value Funds?

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Introduction

- Large literate on **performance** of active mutual funds: Skill?
- Little research of investment behavior of active MFs
- This paper investigates the **portfolio composition of active MFs**
- Question: **How do MF portfolios look like?**
- Organizing principle: Characteristics/risk factors
- In addition: ETFs, hedge fund portfolios (more limited data)
- Existing literature: Take the universe of MFs as given
- **Broader question**: What determines the set of MFs in equilibrium?

Mutual fund portfolios

- CRSP/Thompson-Reuters fund/quarter level portfolio holdings
- Sample: 1980Q1 to 2016Q4
- Standard screens (exclude very small funds, few obs, ...)
- 2,638 **active** mutual funds, 955 ETFs, 114 (small) hedge funds
- Fund objectives: 574 "Value" and 1,230 "Growth" funds

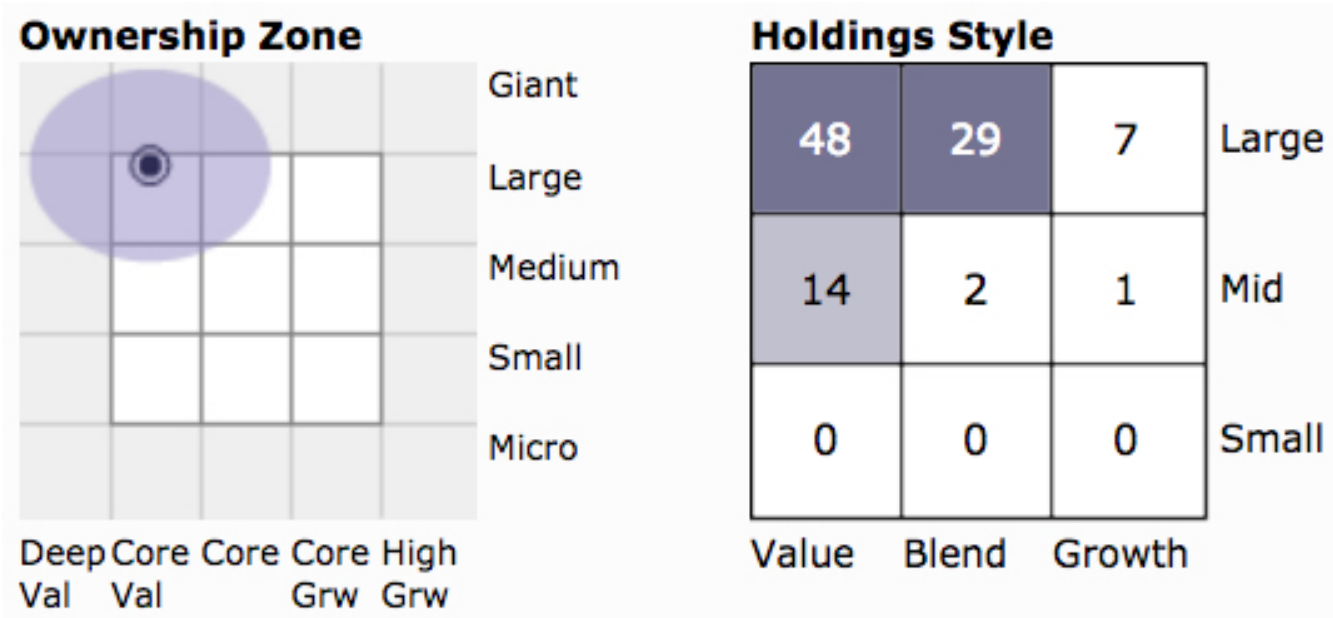
Mutual Fund Characteristics: Book-to-Market (BM)

1. **Characteristic "scores"** for MFs (Daniel et. al., 1997):
   - Each quarter, rank all stocks according to their BM ratio
   - Quintiles (FF NYSE breakpoints): Stocks in quintile $i \Rightarrow$ BM score = i
   - Portfolio-weighted average BM score for each MF/quarter $\in [1, 5]$
   - BM score of 1 (5): MF holds only stocks in lowest (highest) BM quint.
2. **Adjusted characteristics**:
   - Market-adjusted BM for each stock: $\widehat{BM}_i = BM_i / BM_m$
   - Portfolio-weighted average $\widehat{BM}_i$ for each MF/quarter
   - Adj. BM of Mkt = 1

- Other Characteristics: Size (ME), MOM, E/P, D/P, ROE, INVEST, ...
- Many, many robustness checks ...

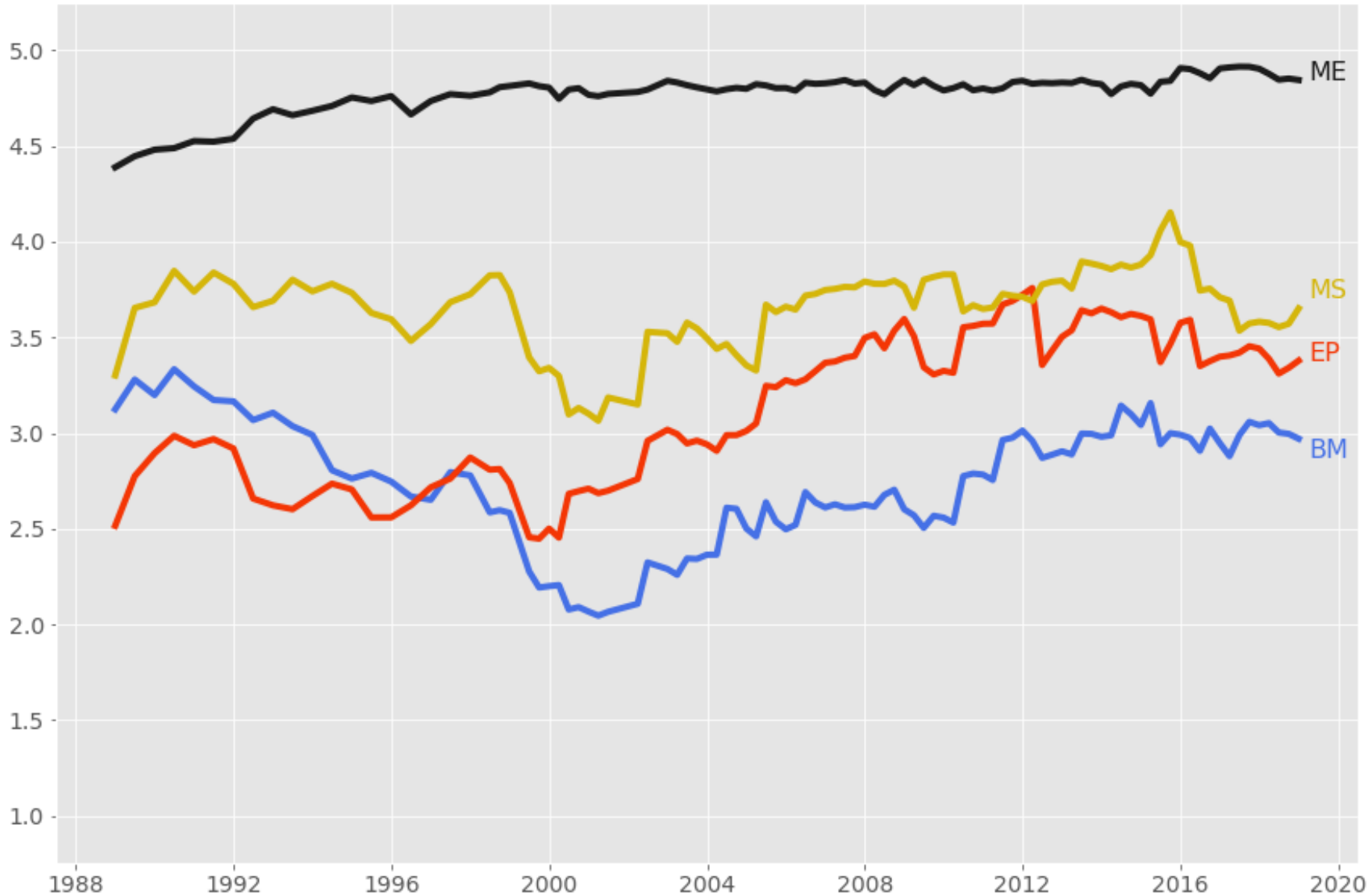
Morningstar's Value/Growth Measure

Morningstar style box for T. Rowe Price Equity Income Fund (PRFDX)



- MS = avg. of E/P, B/P, S/P, CF/P, **E(ΔLTE), ΔE, ΔS, ΔCF, ΔB**
- MS long/short portfolio: **Small return premium**

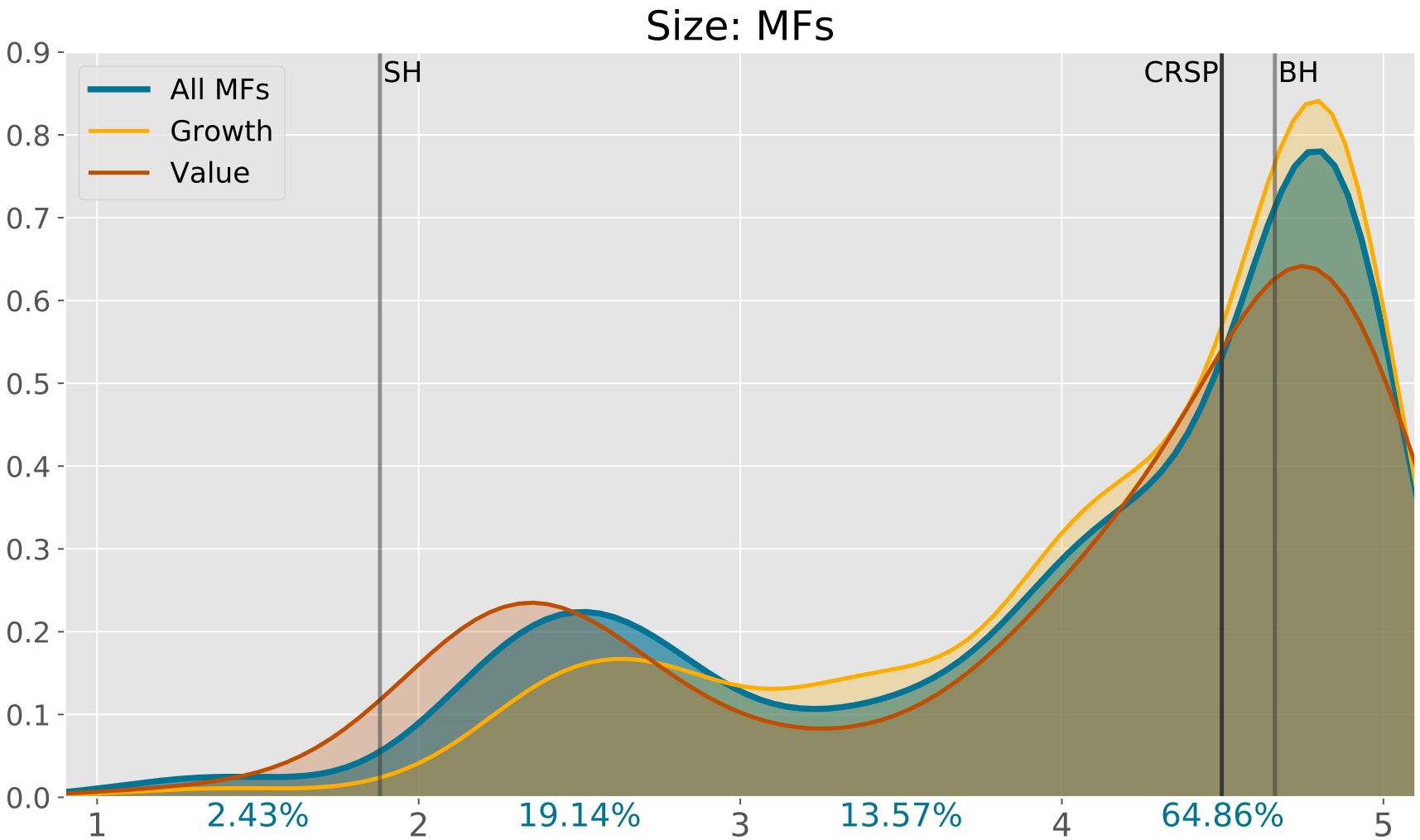
Largest "Value" MF: T Rowe Price Equity Income Fund



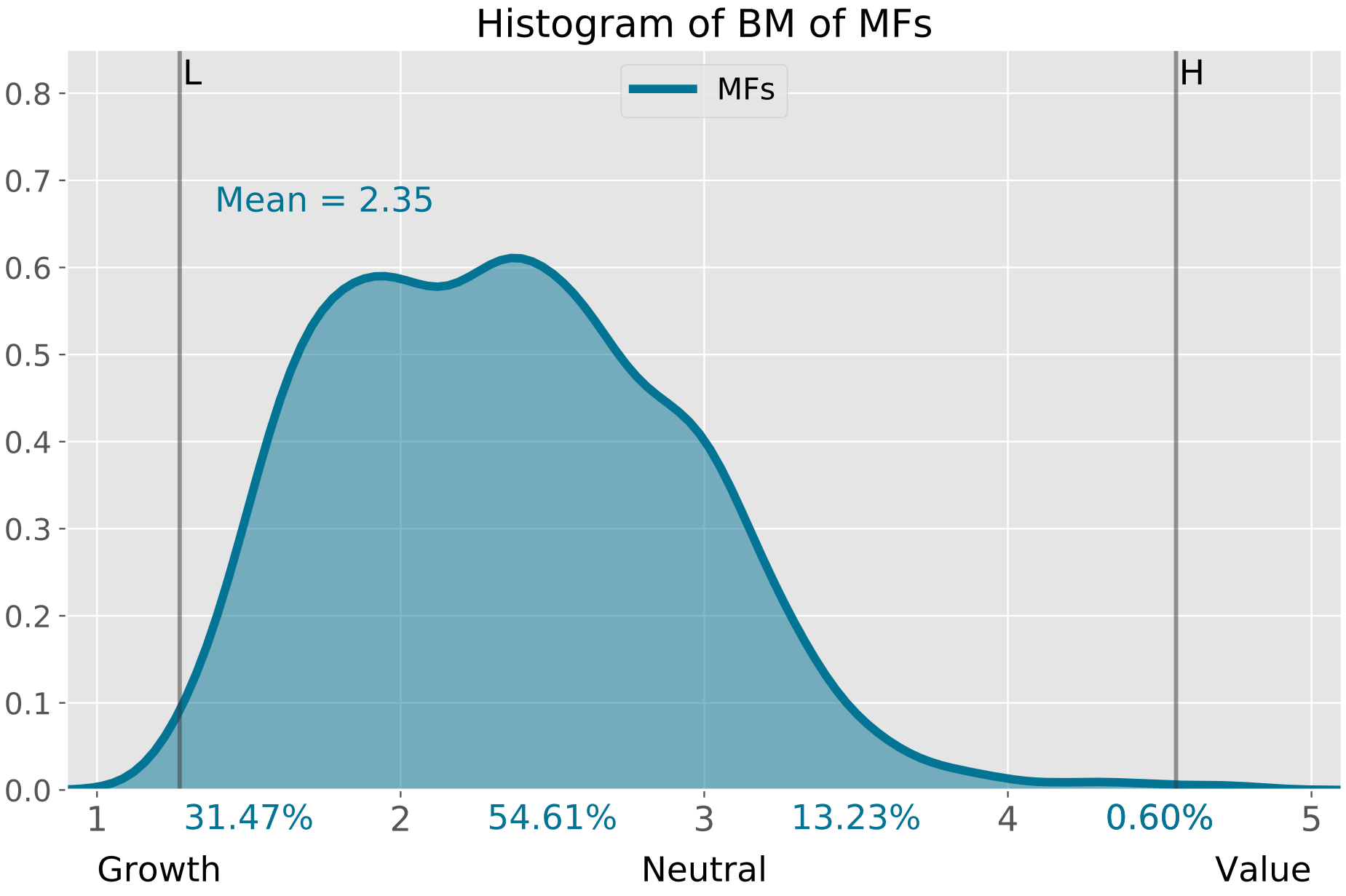
Distributions of Mutual Fund Characteristics

- Histograms across all MFs, “Value” funds and “Growth” funds
- Histograms are smoothed using kernel density estimation
- Benchmarks:
  - Distributions of S&P 500 stocks
  - Characteristics of Fama-French portfolios (H, L, SL, SH, BL, BH)
- Presentation: “Value” vs. “Growth”
- Paper: Size, momentum, ROE, investment, ...

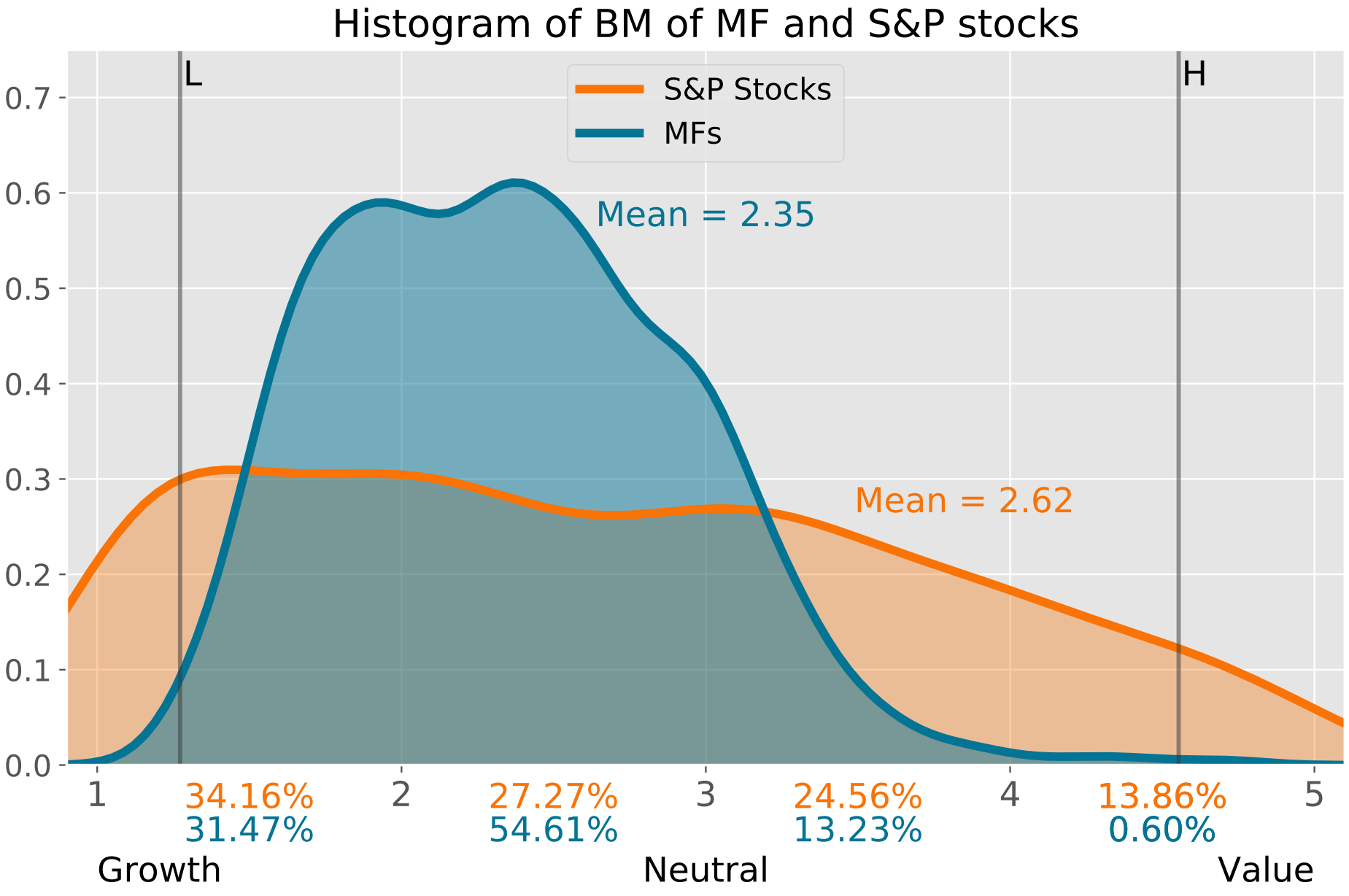
Mutual fund characteristics: Size (ME)



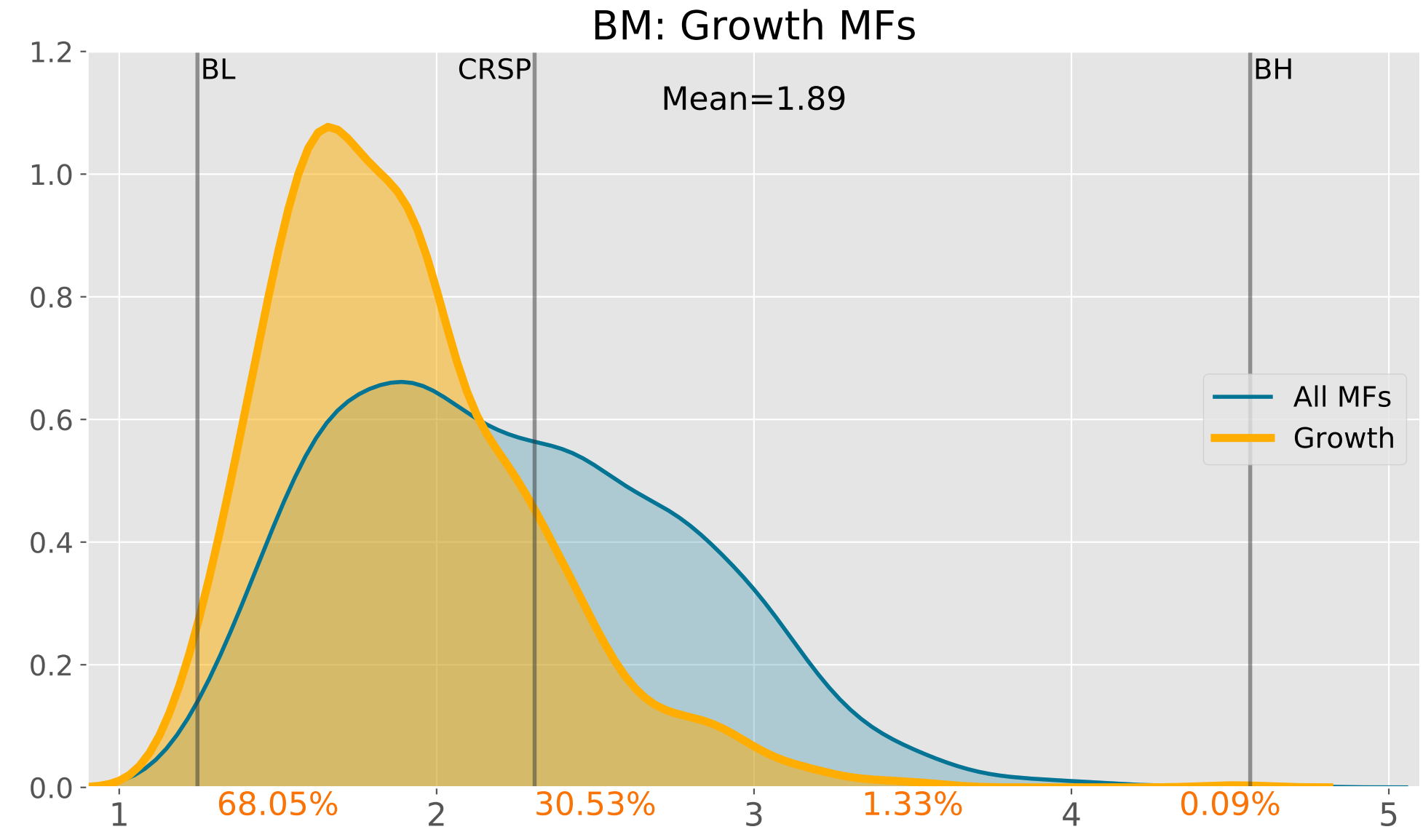
Mutual fund characteristics: BM



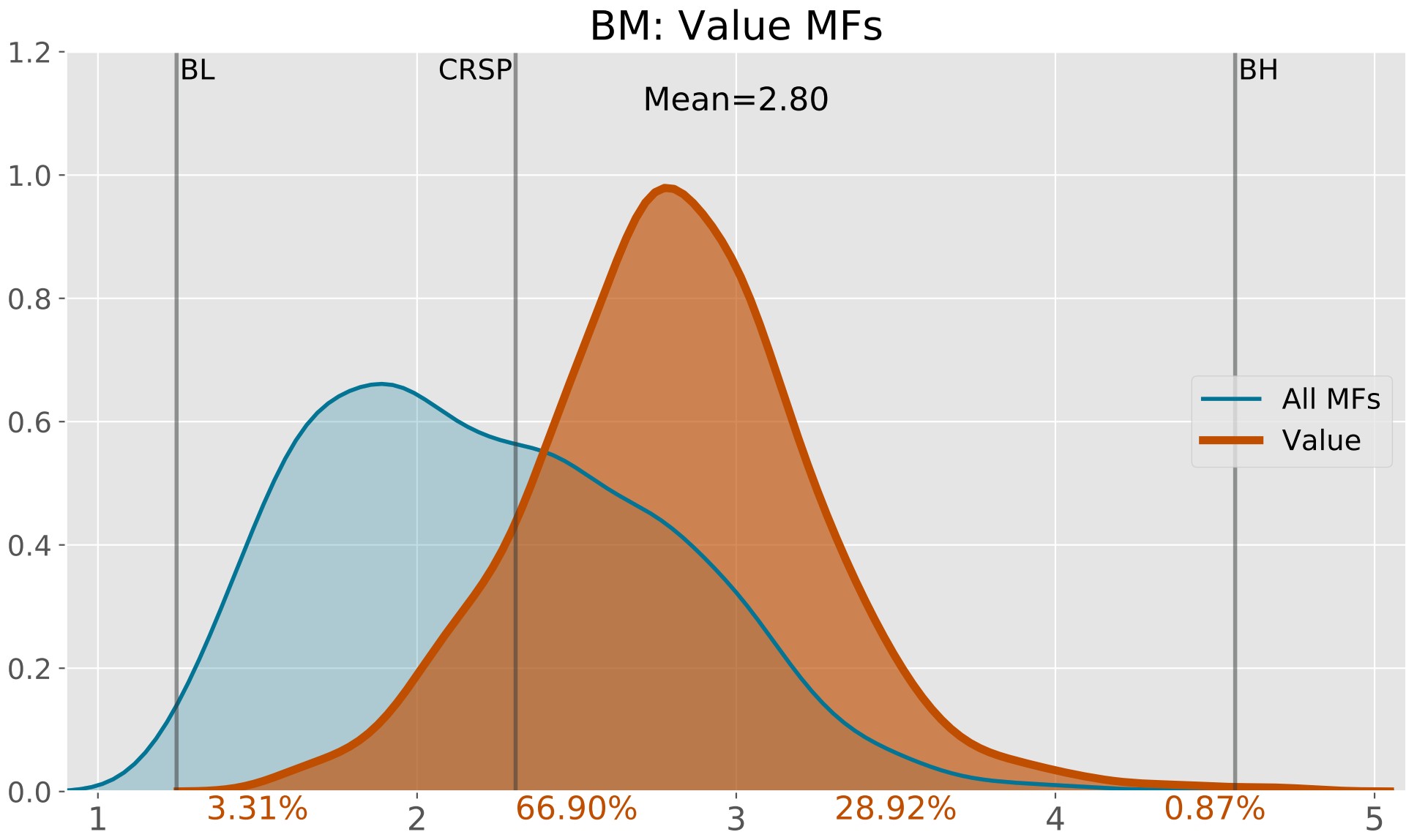
S&P500 Stocks characteristics: BM



Mutual fund characteristics: BM – Growth funds



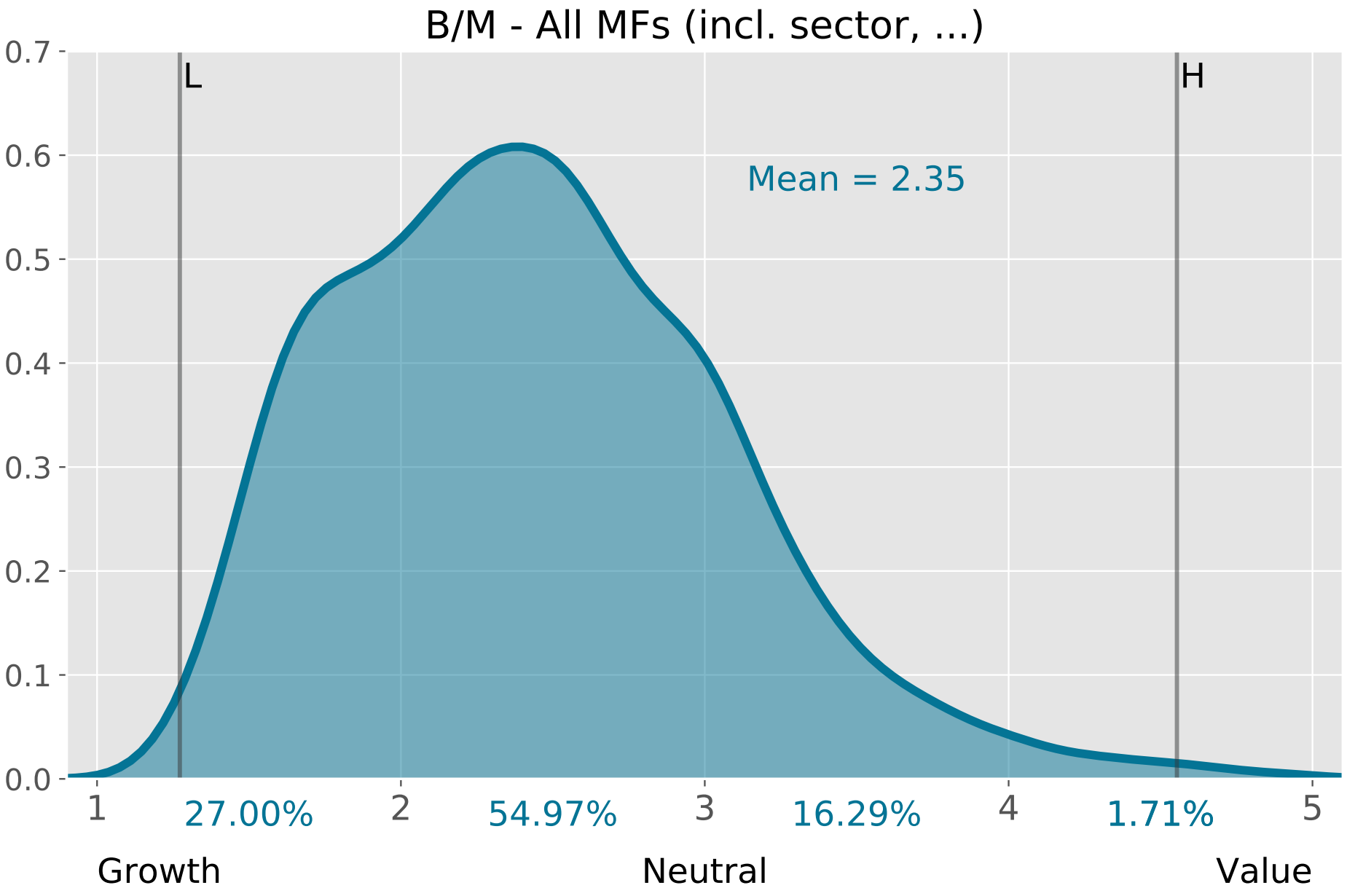
Mutual fund characteristics: BM – Value funds



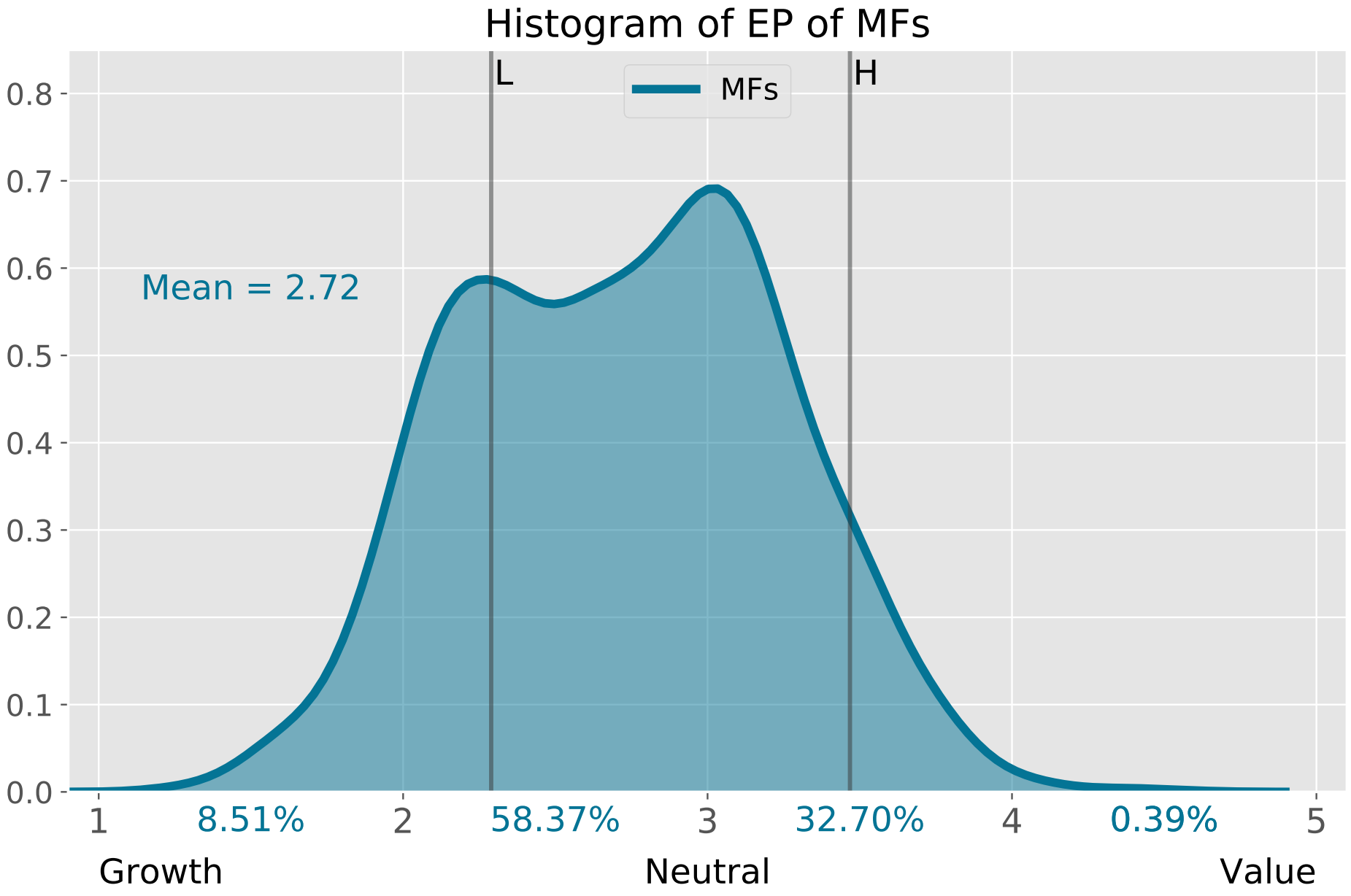
Robustness

- Other multiples (EP, DP, ...)
- Other measures: Mkt-adjusted w/o breakpoints,...
- Distribution of MF BM is stable over time
- Paper: Formal estimation of likelihood that a stock is held by MFs depending on its characteristics
- Many additional robustness checks

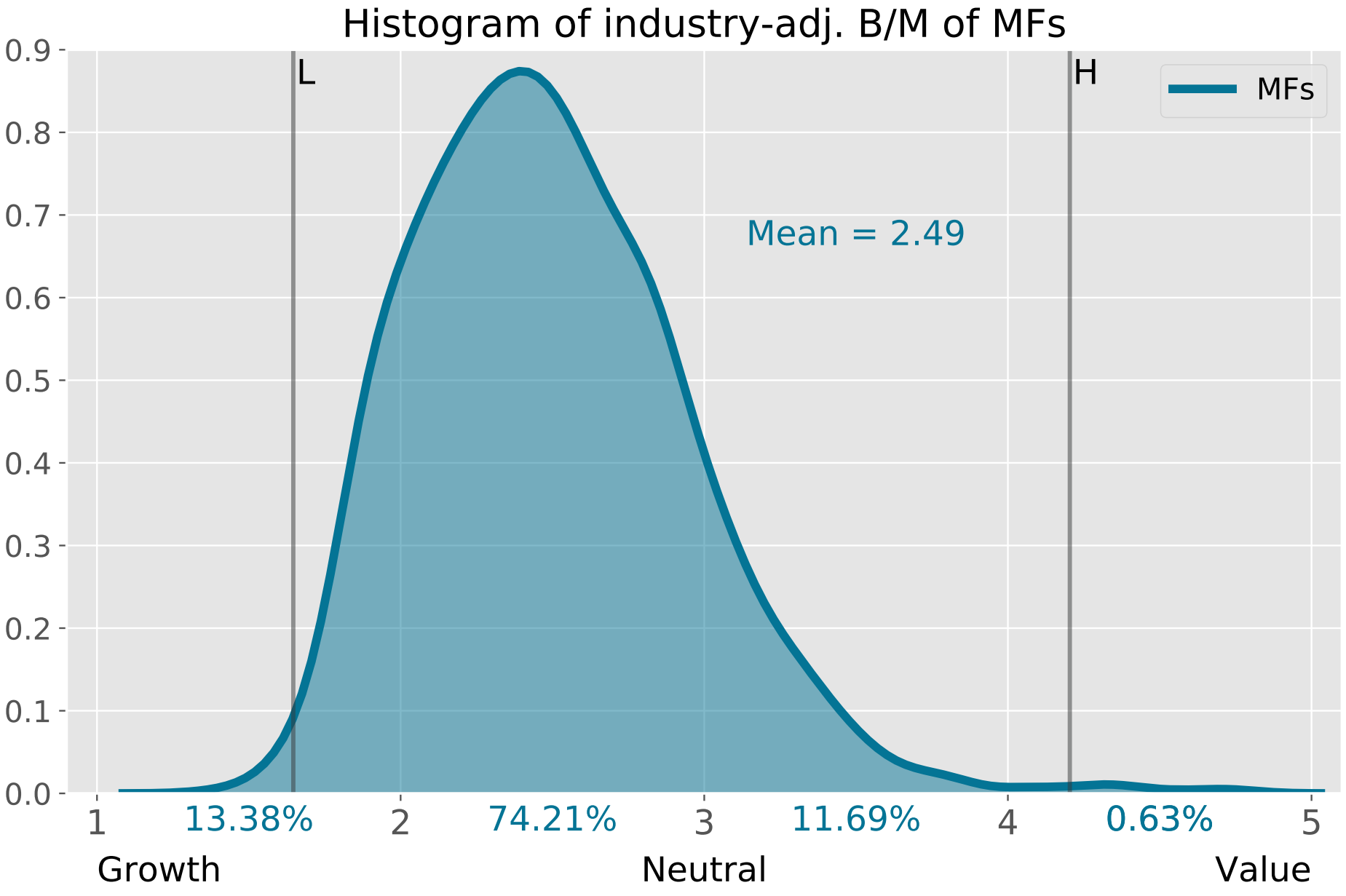
BM – All MFs, including sector funds



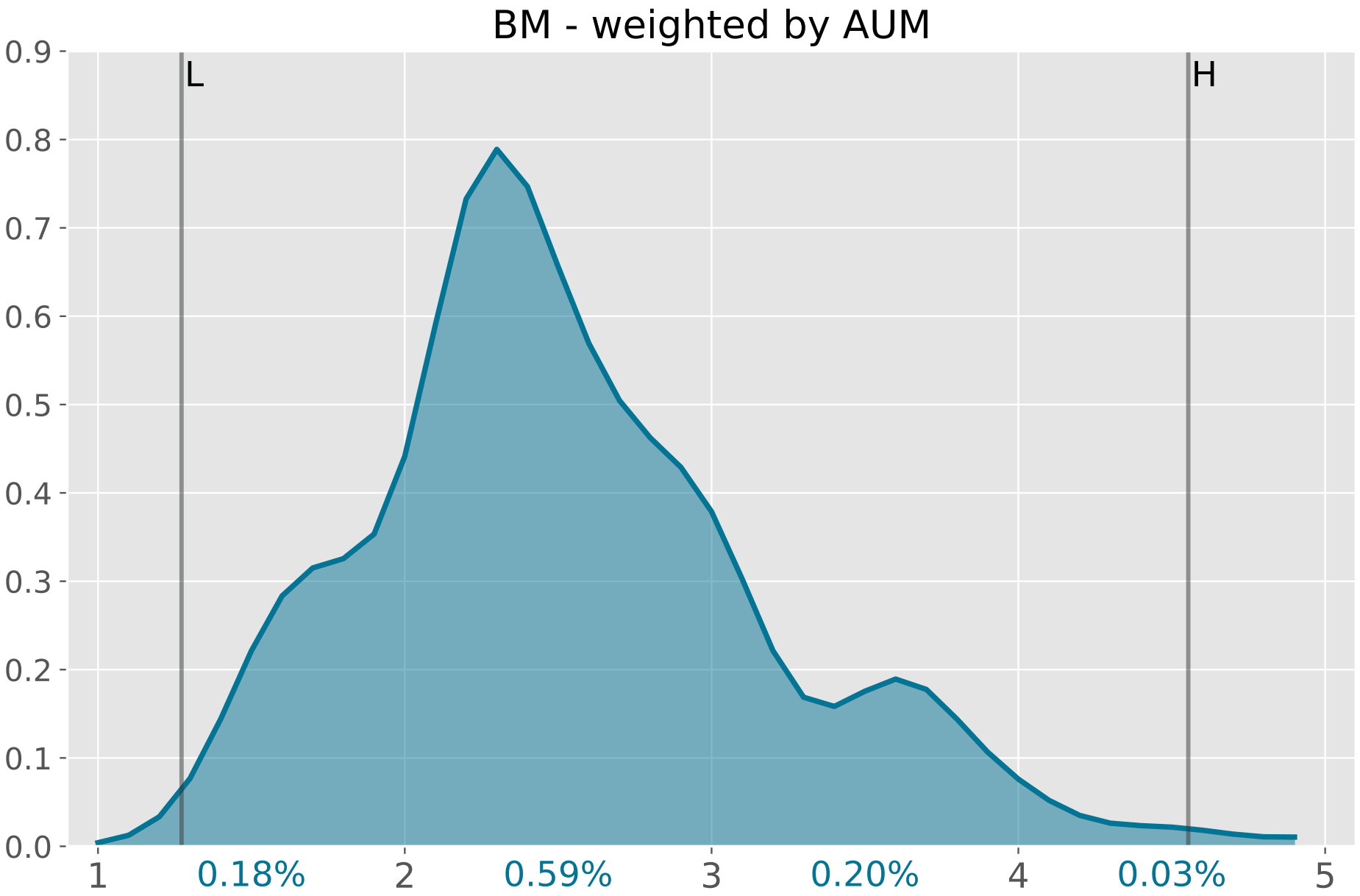
EP


Histogram of EP of MFs
L
H
MFs
Mean = 2.72
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1
2
3
4
5
8.51%
58.37%
32.70%
0.39%
Growth
Neutral
Value

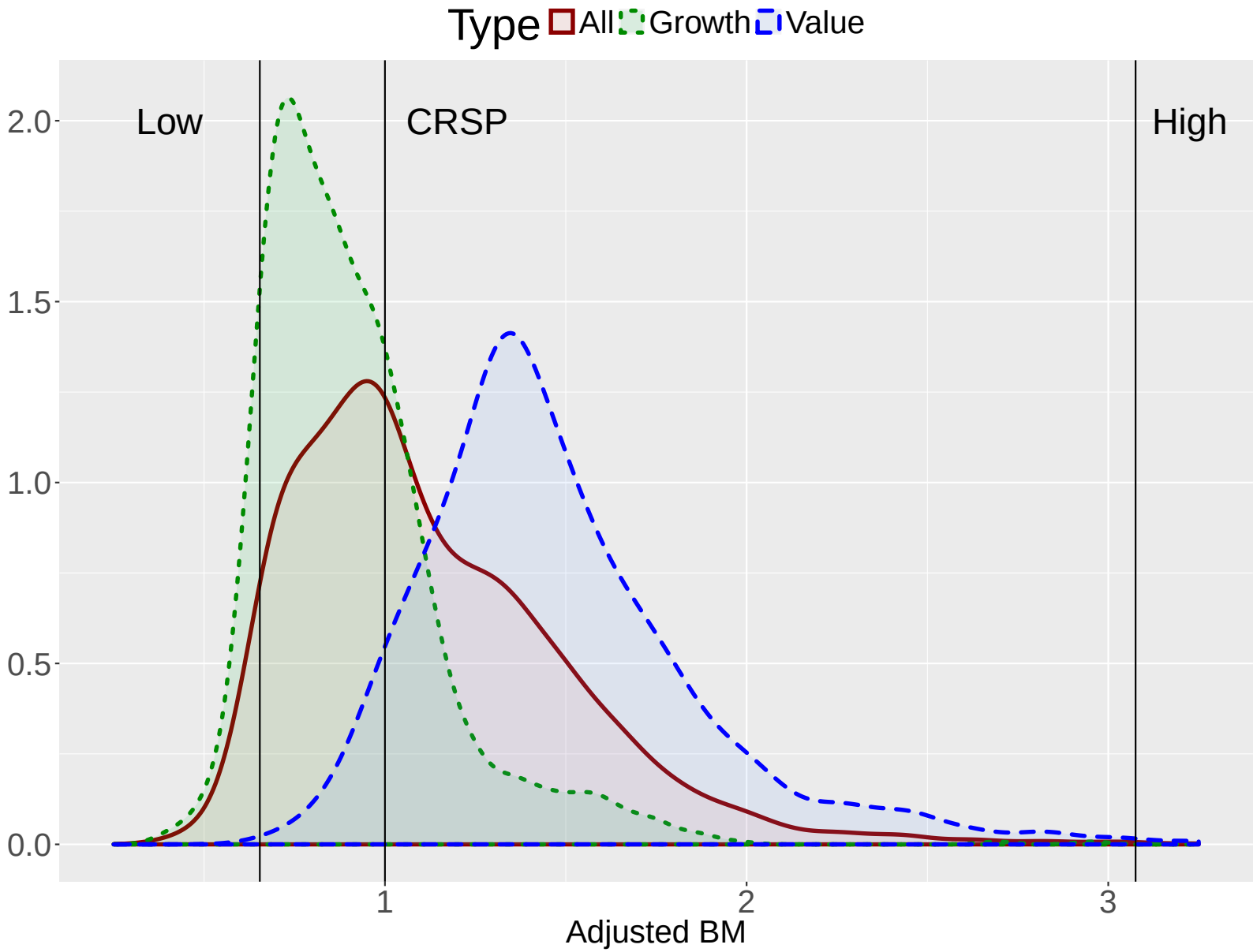
Industry-adjusted BM



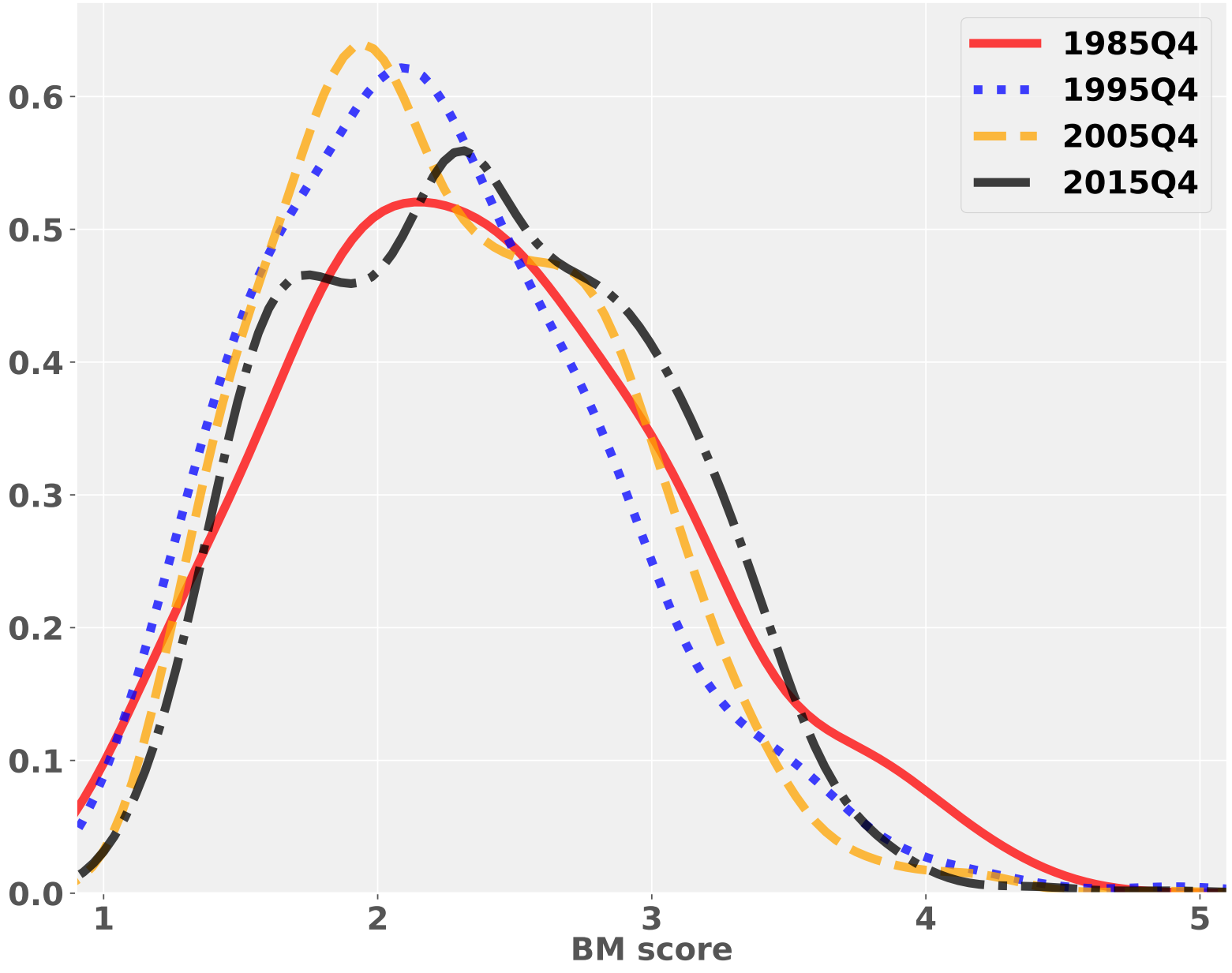
MF – WEIGHTED BY AUM



Market-adjusted BM



Subsamples


1985Q4
1995Q4
2005Q4
2015Q4
0.0
0.1
0.2
0.3
0.4
0.5
0.6
1
2
3
4
5
BM score

Other Multiples

Characteristic	Mutual Funds				Stocks			
	[1-2]	[2-3]	[3-4]	[4-5]	[1-2]	[2-3]	[3-4]	[4-5]
BM	32%	54%	12%	1%	34%	27%	25%	14%
MS	29%	45%	25%	1%	28%	29%	26%	17%
EP	8%	62%	29%	0%	26%	35%	27%	13%
CFP	17%	58%	24%	1%	25%	35%	26%	14%
DP	16%	39%	37%	8%	27%	20%	30%	23%
SP	33%	61%	05%	0%	35%	27%	21%	16%

The MF distributions of all multiples is shifted to the left relative to the distributions of S&P 500 stocks

Mutual fund characteristics: BM

- MF BM distribution is skewed compared to the distribution of S&P stocks
- 1,050 MFs have BM score below 3
- Only **7 MFs have a BM score above 4**
- Many funds close to FF portfolio "L" but none close to "H"
- "Growth" funds are more tilted towards low BM
- But even **"Value funds" have an average BM score below 3**

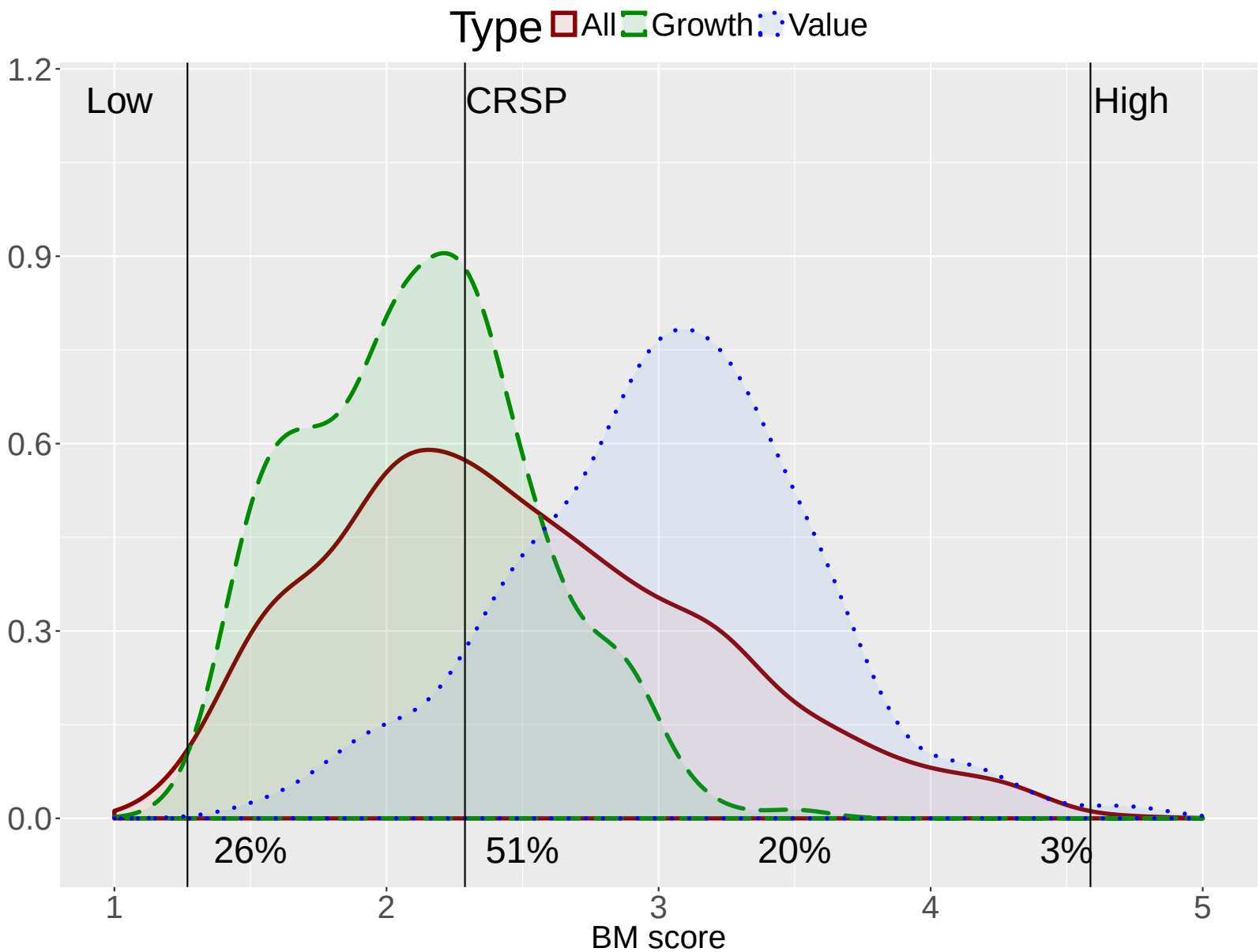
The MF distribution is heavily tilted towards low BM and there are virtually no high-BM funds in the US

Missing value funds: 7 MFs with BM>4 (out of 2,638)

Fund	BM	MS	MOM	ME	Size (mil.)
"H" portfolio	4.59	3.90	3.30	3.25	NA
Aegis Value Fund	4.69	3.56	3.09	1.36	276
Mellon Capital S&P SMid 60	4.51	3.89	3.33	2.69	400
Franklin MicroCap Value Fund	4.44	3.45	3.30	1.11	285
Franklin Balance Sheet Investment Fund	4.30	3.77	3.27	2.89	1887
Dow Target Dividend Portfolio	4.12	4.23	3.20	3.73	20
DFA US Small Cap Value Portfolio	4.10	3.23	3.40	1.88	5925
Ancora Special Opportunity Fund	4.05	3.05	2.75	1.94	7
DFA US Targeted Value Portfolio	3.99	3.74	3.39	4.74	306
SA US Value Fund*	3.99	3.33	3.34	2.51	1849
DFA US Large Cap Value Portfolio	3.96	3.77	3.35	4.68	6307

*: sub-advised by DFA

BM DISTRIBUTION OF ETFs



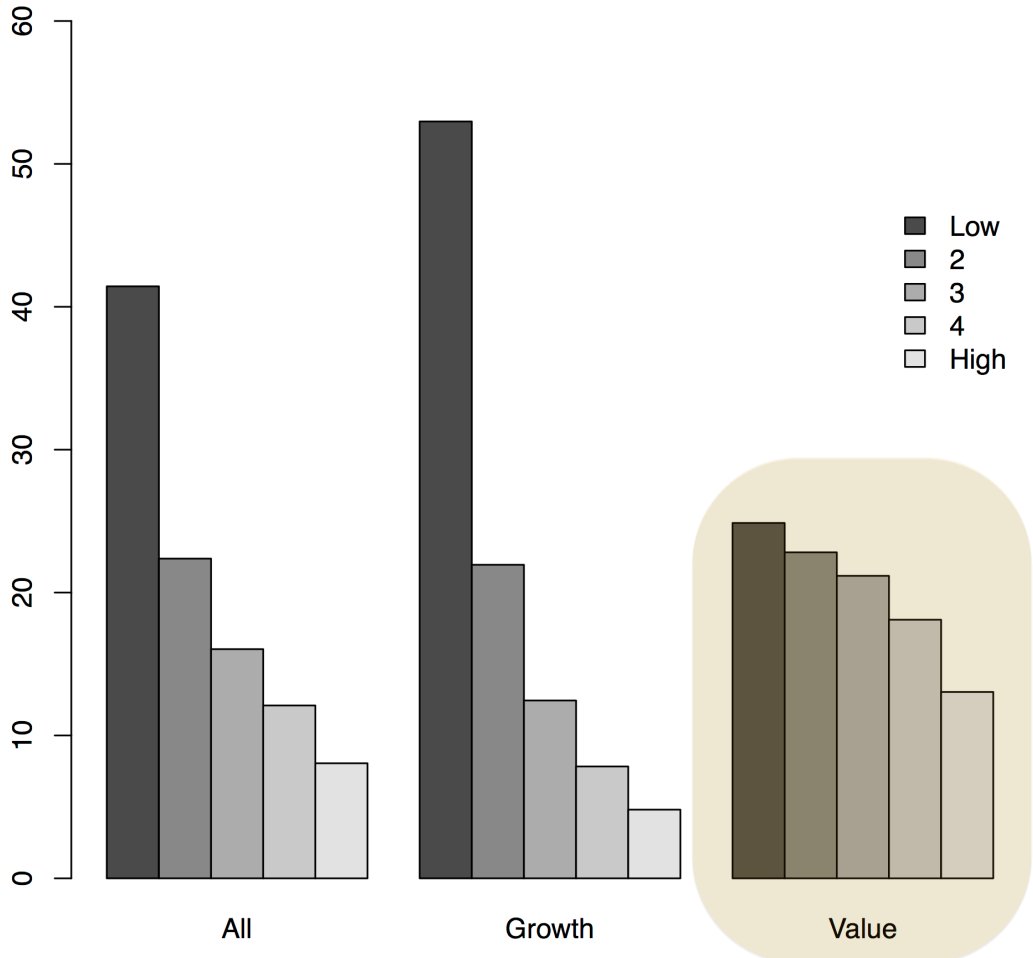
A CLOSER LOOK AT MUTUAL FUNDS PORTFOLIOS

- So far: Average scores across 5 quintiles
- Next: **Portfolio shares in each quintile**
- 5 largest "Value" funds:

	BM1	BM2	BM3	BM4	BM5
T Rowe Price Equity Income Fund	29.29%	23.56%	19.28%	14.59%	13.28%
Fidelity Equity-Income Fund	19.89%	22.66%	20.49%	22.36%	14.60%
T Rowe Price Value Fund, Inc	24.97%	24.43%	20.29%	14.34%	15.96%
Fidelity Value Fund	18.10%	25.93%	23.06%	19.61%	13.29%
DFA US Large Cap Value	0.84%	4.26%	25.42%	37.98%	31.50%

- 4 of 5 largest "Value" MFs: **More low-BM stocks than high-BM stocks!**

A CLOSER LOOK AT MUTUAL FUNDS PORTFOLIOS: BM QUINTILES



- Portfolios of "Growth" MFs are concentrated on low BM stocks
- **"Value" MFs invest larger share in low BM stocks than in high BM stocks**

Liquidity?

- Is the lack of high-BM funds due to low liquidity of high-BM stocks?
- Most MFs hold very large stocks
- Does liquidity vary across BM stocks and MFs?
  - Pastor-Stambaugh liquidity measure
  - Turnover: Shares traded/Shares outstanding

Do High-BM MFs Hold Illiquid Stocks?

- Mean of liquidity scores by BM quintiles for stocks and MFs

	BM Score				
Stocks	1	2	3	4	5
PS	3.10	3.09	3.08	3.08	3.06
Turnover	3.53	3.39	3.37	3.27	3.42

	BM Score			
MFs	[1, 2]	(2, 3]	(3, 4]	(4, 5]
PS Liq.	3.12	3.11	3.05	3.01
Turnover	3.45	3.07	3.03	2.62

Mutual fund characteristics and returns

Quintile	ME	BM	MS	MOM
		Stocks		
1	4.06	2.38	3.25	2.89
2	3.54	3.64	3.96	3.56
3	3.63	4.00	4.04	3.94
4	3.64	4.25	4.35	4.22
5	3.17	5.20	4.32	4.55
5-1	-0.88	2.82	1.07	1.66
		Mutual Funds		
[1, 2]	2.37	2.17	2.23	1.88
(2, 3]	2.75	2.38	2.39	2.09
(3, 4]	2.84	2.48	2.32	2.63
(4, 5]	2.11	2.95	2.17	1.12
(4, 5] - [1, 2]	-0.25	0.78	-0.05	-0.76

Fama-MacBeth regressions

$$R_{i,t+1} - R_{f,t+1} = \boldsymbol{\beta}_t' \mathbf{X}_{i,t} + e_{i,t+1}$$

ME	MOM	BM
	Stocks	
-0.26	0.39	0.54
[-1.65]	[2.44]	[5.01]
	Mutual Funds	
-0.45	0.39	–0.02
[-3.11]	[1.39]	[-0.14]

- Stocks: ME, MOM and BM premia, small MS premium smaller and insignificant
- MFs: ME and MOM premium similar those in stocks, no BM and MS premia

Additional results

- Other characteristics
- Characteristics of ETFs and HFs
- Alternative measure of characteristics: Regression loadings
  - Easier to compute than measures based on holdings
  - Subject to estimation error
  - Based on past data
  - Interpretation of magnitudes:
    - $\beta_{HML,1} = -0.5, \beta_{HML,2} = 0, \beta_{HML,3} = 0.5$ does not necessarily imply that asset 1 is "growth", asset 2 is "neutral", and asset 3 is "value"
    - It is possible that $\beta_{C,i} > 0 \; \forall i \; \beta_{C,i} < 0 \; \forall i$!

Conclusion

Puzzle: U.S. mutual funds are **strongly tilted towards low BM stocks**

- Many low-BM funds
- But (essentially) **no high-BM funds**
- "Growth" funds invest in low-BM stocks but
- ... **"Value" funds hold more low-BM stocks than high-BM stocks**
- Investors cannot exploit BM-premium via mutual funds

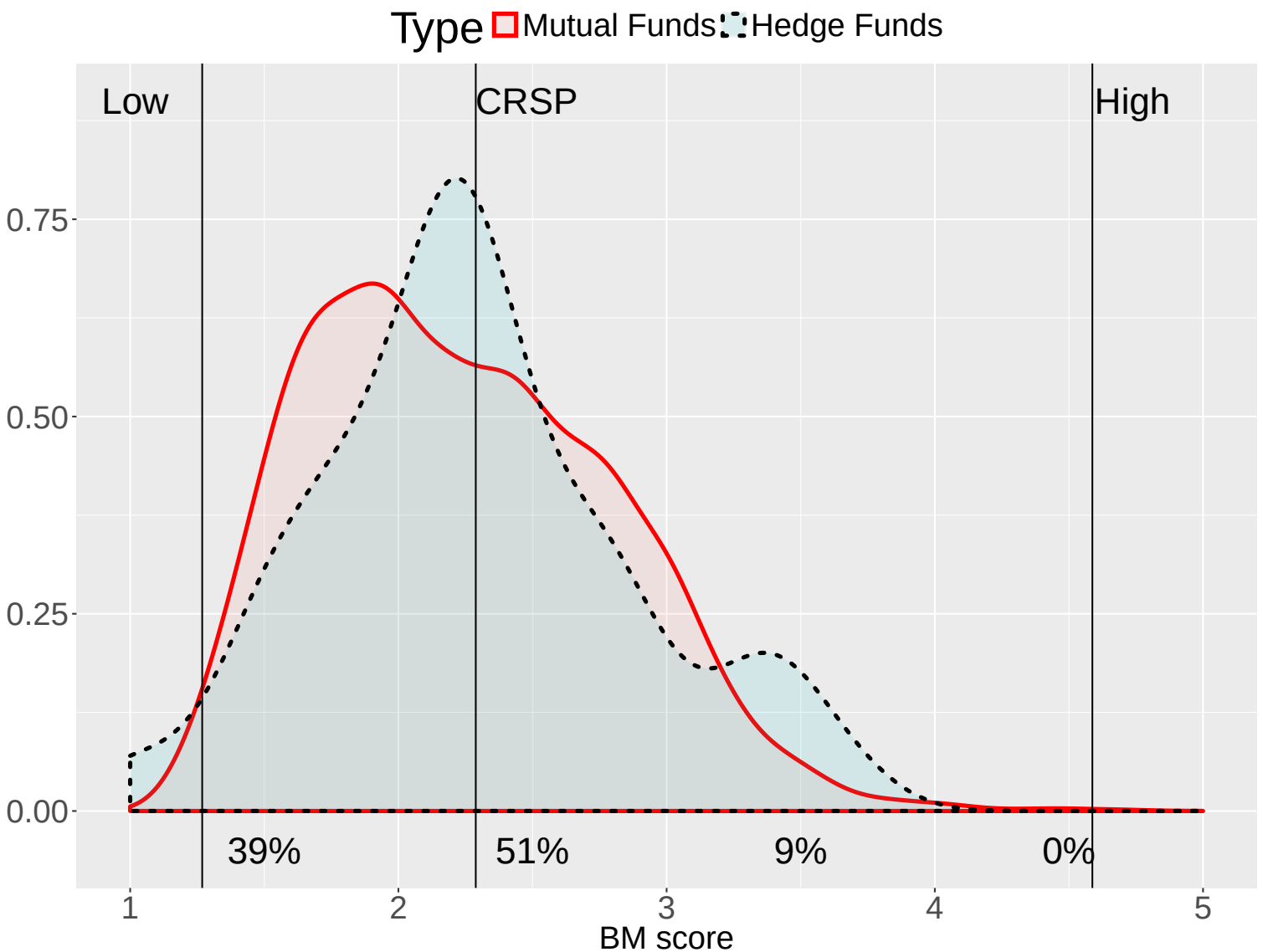
Open question: Why?

- Set of existing funds is an **endogenous object**
- Does skill/expertise of MF managers attract capital?
- Do investors have preferences over styles and investment managers create funds to satisfy demand?
- Consequences for prices and "Value" premium?

Hedge funds

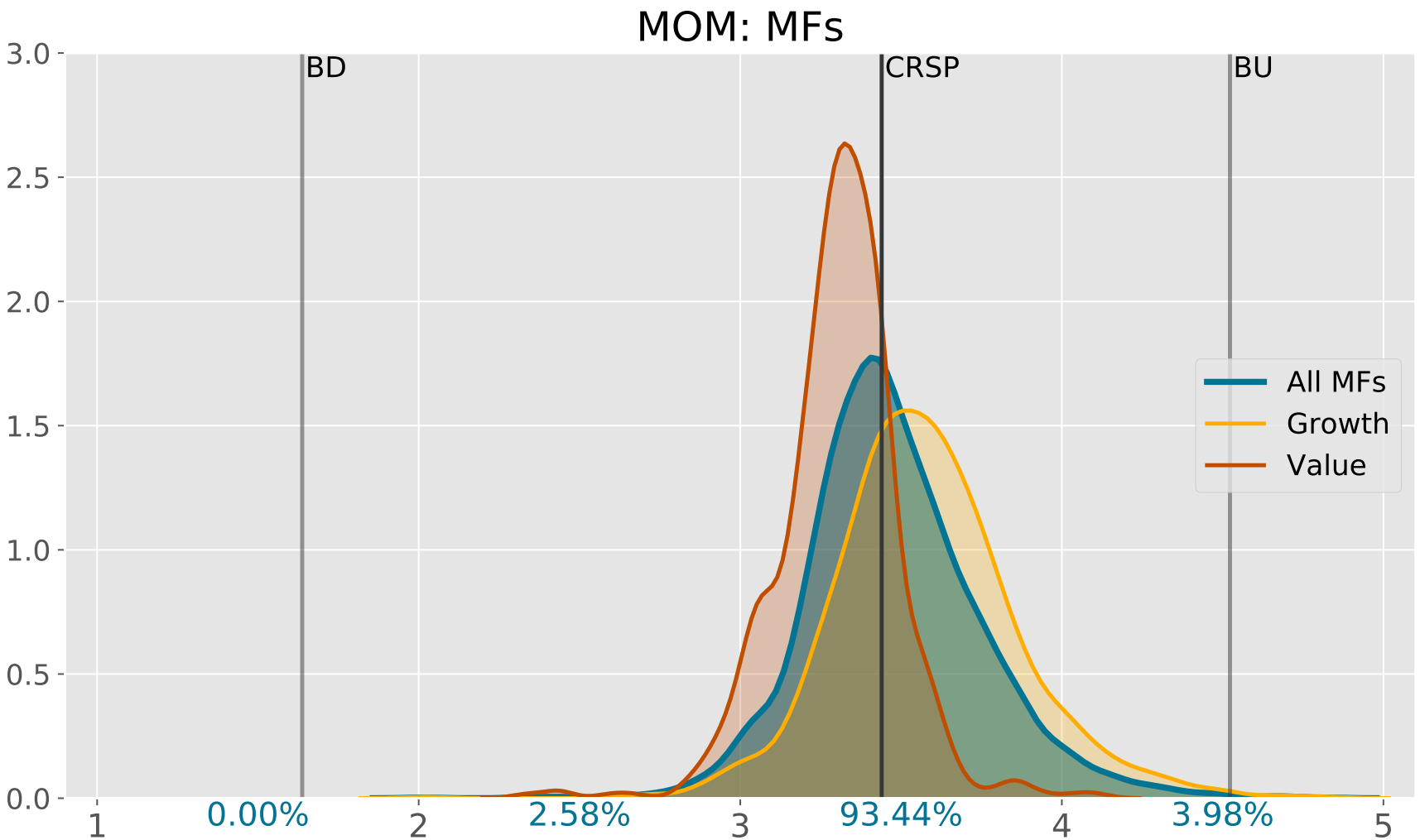
- Individual hedge funds do not report their holdings
- Available data: **Returns** but no holdings data
- But all institutional money management firms report holdings to the SEC (form 13F) on the **firm level**
- Example: AQR reports aggregate AQR holdings to the SEC but not holdings of individual funds
- We identify 114 hedge fund firms with only **one individual fund**
- We construct portfolio holdings for these 114 HFs from their 13Fs
- Note: Our sample of HFs is small and not representative!

BM distribution of Hedge Funds



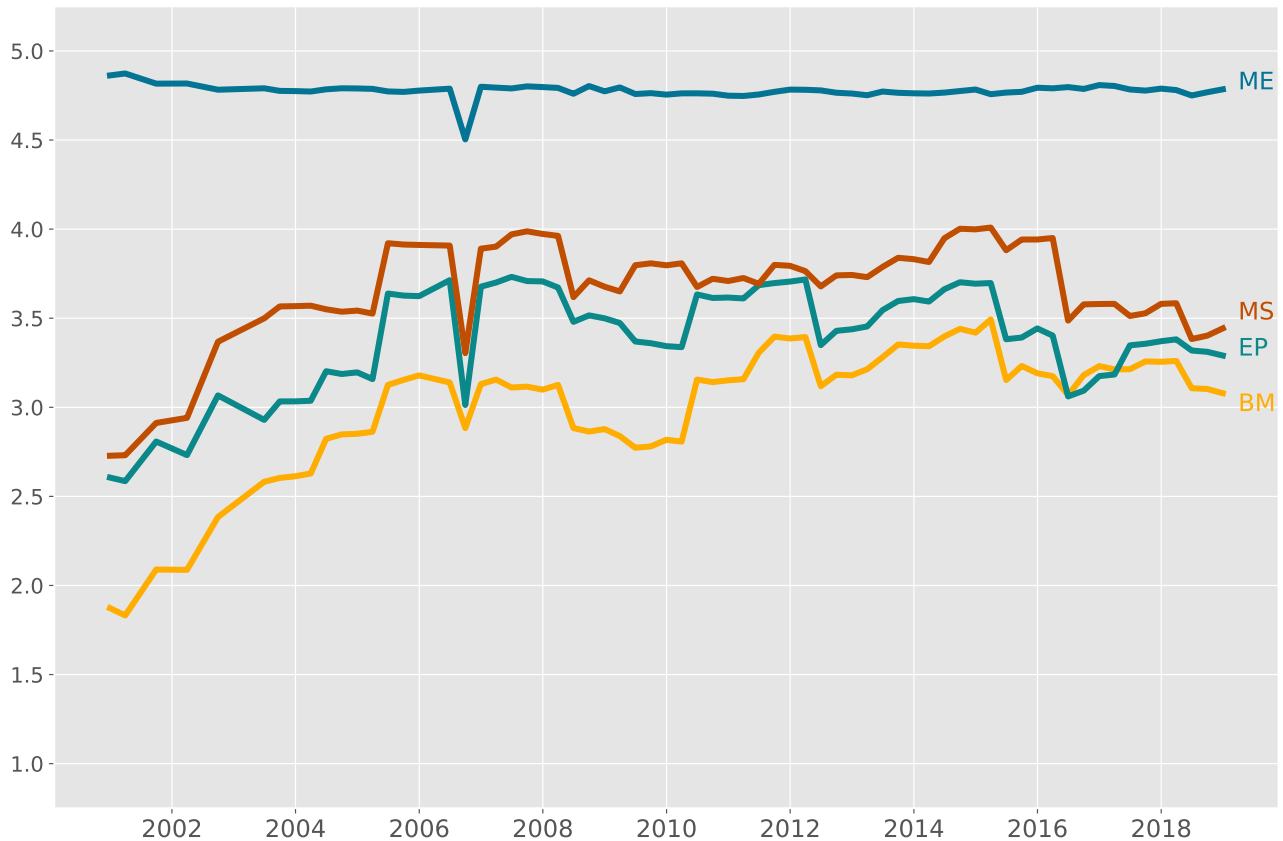
BM distribution of HFs similar to that of MFs

Mutual fund characteristics: Momentum



Example: iShares Russell 1000 Value

- Most ETFs track indices that are similar to Morningstar MS
- Russell documentation: "FTSE Russell uses three variables in the determination of growth and value. For value, **book-to-price (B/P) ratio** is used, while for growth, two variables, **I/B/E/S forecast medium-term growth (2-year) and sales per share historical growth (5-year)** are used."



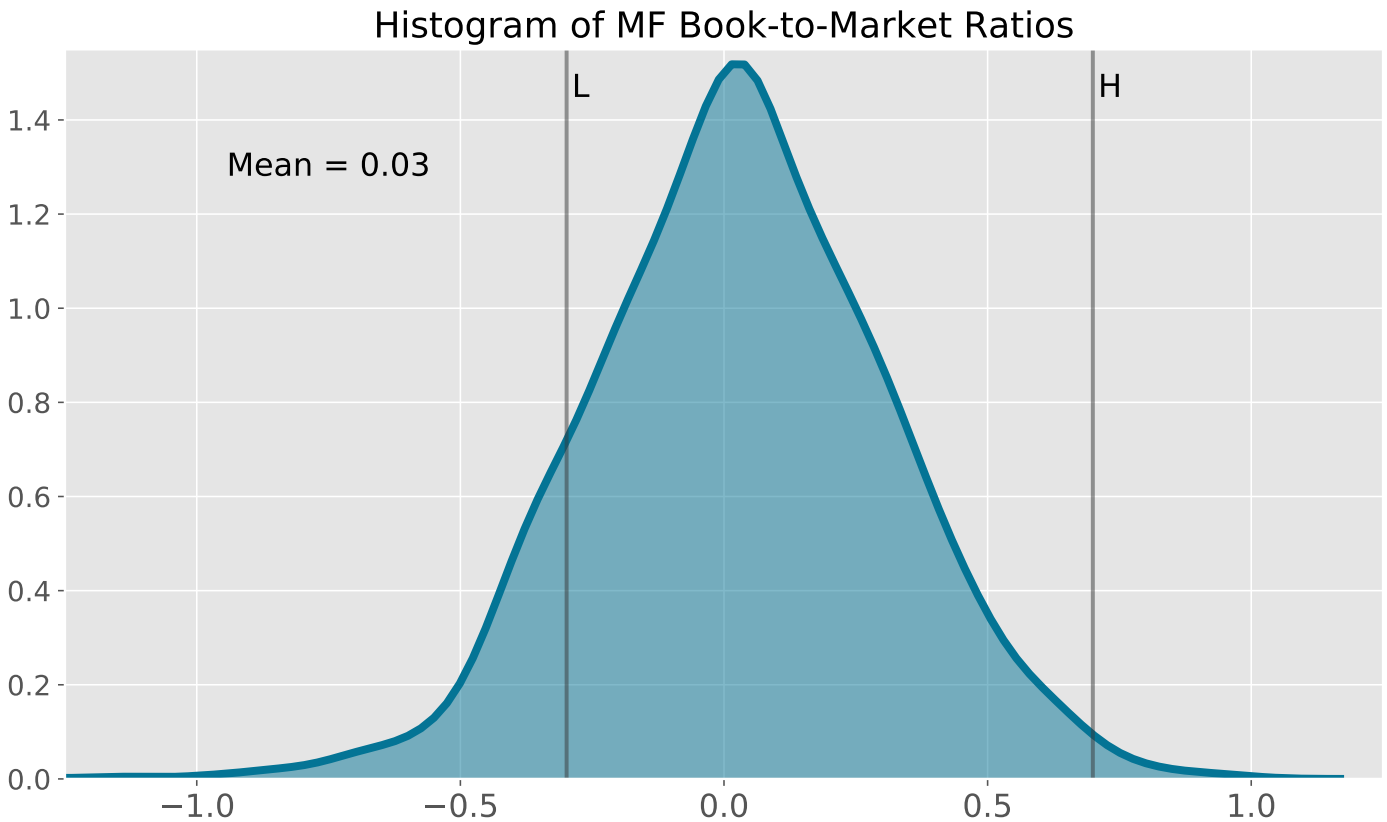
Holdings vs. loadings

Alternative measure of MF strategy: Regression loadings

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,\text{MKT}}\,\text{MKT}_t + \beta_{i,\text{SMB}}\,\text{SMB}_t + \beta_{i,\text{HML}}\,\text{HML}_t + \beta_{i,\text{MOM}}\,\text{MOM}_t + e_{i,t}$$

- The β's measure exposure to long/short "factor portfolios"
- How do β's compare to holdings as measures of MF strategies?
  - β's are subject to estimation error
  - Historical data might not reflect current portfolio (e.g. for Momentum)
  - Betas are varying over time
  - Magnitudes are difficult to interpret

HML LOADINGS



HML-β's are centered around 0! $\longrightarrow$ Contradiction with BM scores??

No!! The magnitudes of regression loadings are difficult to interpret.

Holdings vs. loadings: Example

- Let P_t and Q_t be high/low characteristics portfolios
- The long/short portfolios is $PMQ_t = P_t - Q_t$
- TS regressions of P_t and Q_t on PMQ_t

$$P_t = \alpha_P + \beta_{P,PMQ}\, PMQ_t + e_{P,t}$$

$$Q_t = \alpha_Q + \beta_{Q,PMQ}\, PMQ_t + e_{Q,t}$$

- Since $PMQ_t = P_t - Q_t$:

$$\beta_{P,PMQ} - \beta_{Q,PMQ} = 1$$

$$\sigma_P > \sigma_Q \iff |\beta_{P,PMQ}| > |\beta_{Q,PMQ}|$$

- The magnitudes of β's depend on the **relative volatilities** of P and Q

Holdings vs. loadings: Example

- HML: $\sigma_L > \sigma_H \Rightarrow |\beta_{L,HML}| = |-0.75| > \beta_{H,HML} = 0.25$
- "BM-neutral" portfolio $(H + L)/2$: $\beta_{HML} = -0.25 < 0$
- SMB: $\beta_{S,SMB} = 1.60 > \beta_{B,SMB} = 0.60 > 0$!
- Example: MF with $\beta_{SMB} = 1.7$ and $\beta_{HML} = 0$ is a small growth fund even though SMB-β is positive and HML-β is 0!
- The magnitudes of time-series β's are to some degree arbitrary

Holdings vs. loadings: 4-factor betas of 25 ME/BM portfolios

Multivariate betas depend on the joint covariance structure of
X = [MKT, S, B, H, L]′

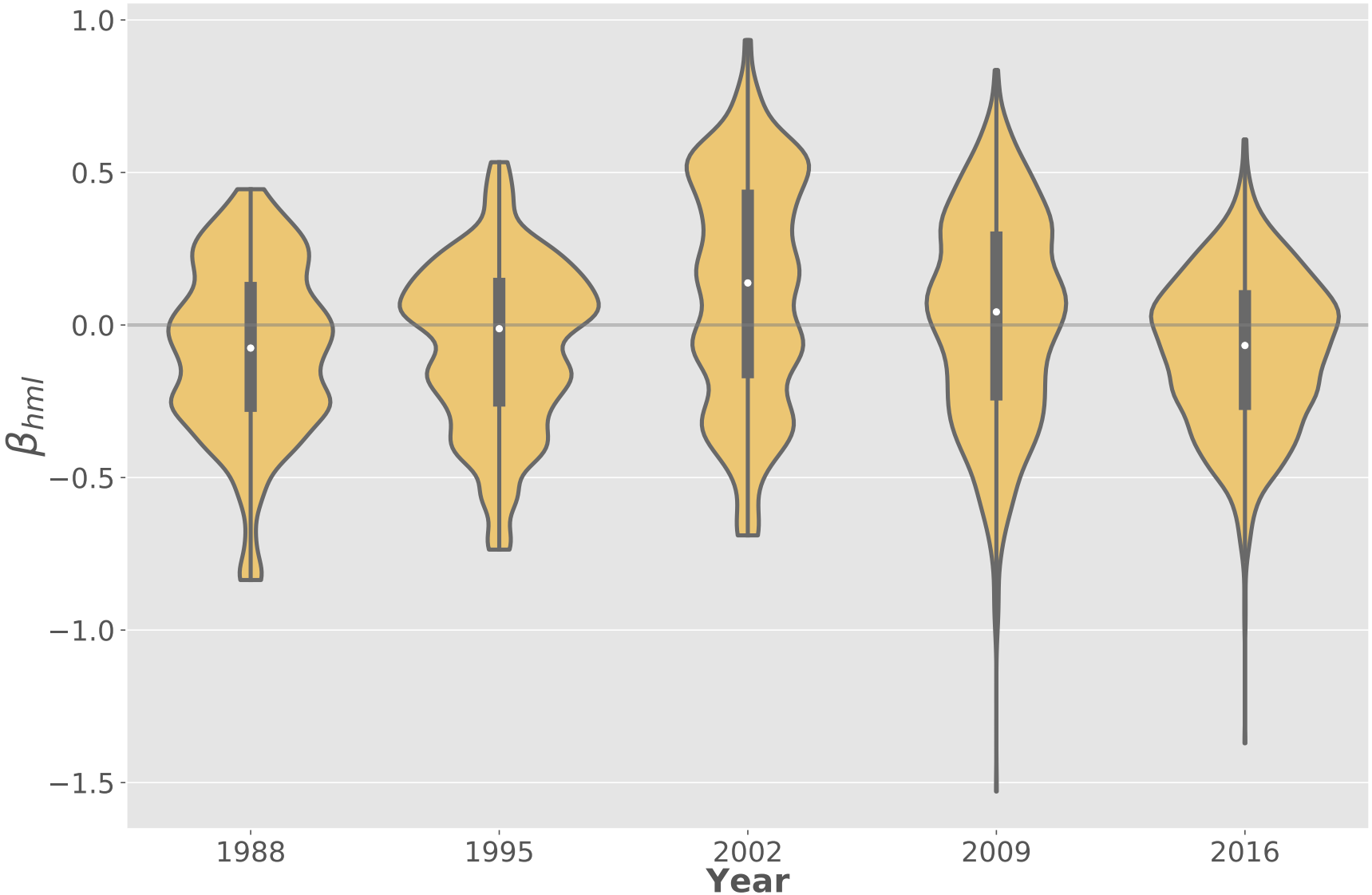
$$X_t = \alpha_X + \beta_{XMKT}\, MKT_t + \beta_{XSMB}\, SMB_t + \beta_{i,HML}\, HML_t + e_{X,t}$$

$$\beta_{L,HML} = -0.28, \beta_{(H+L)/2,HML} = 0.44, \beta_{H,HML} = 0.72$$

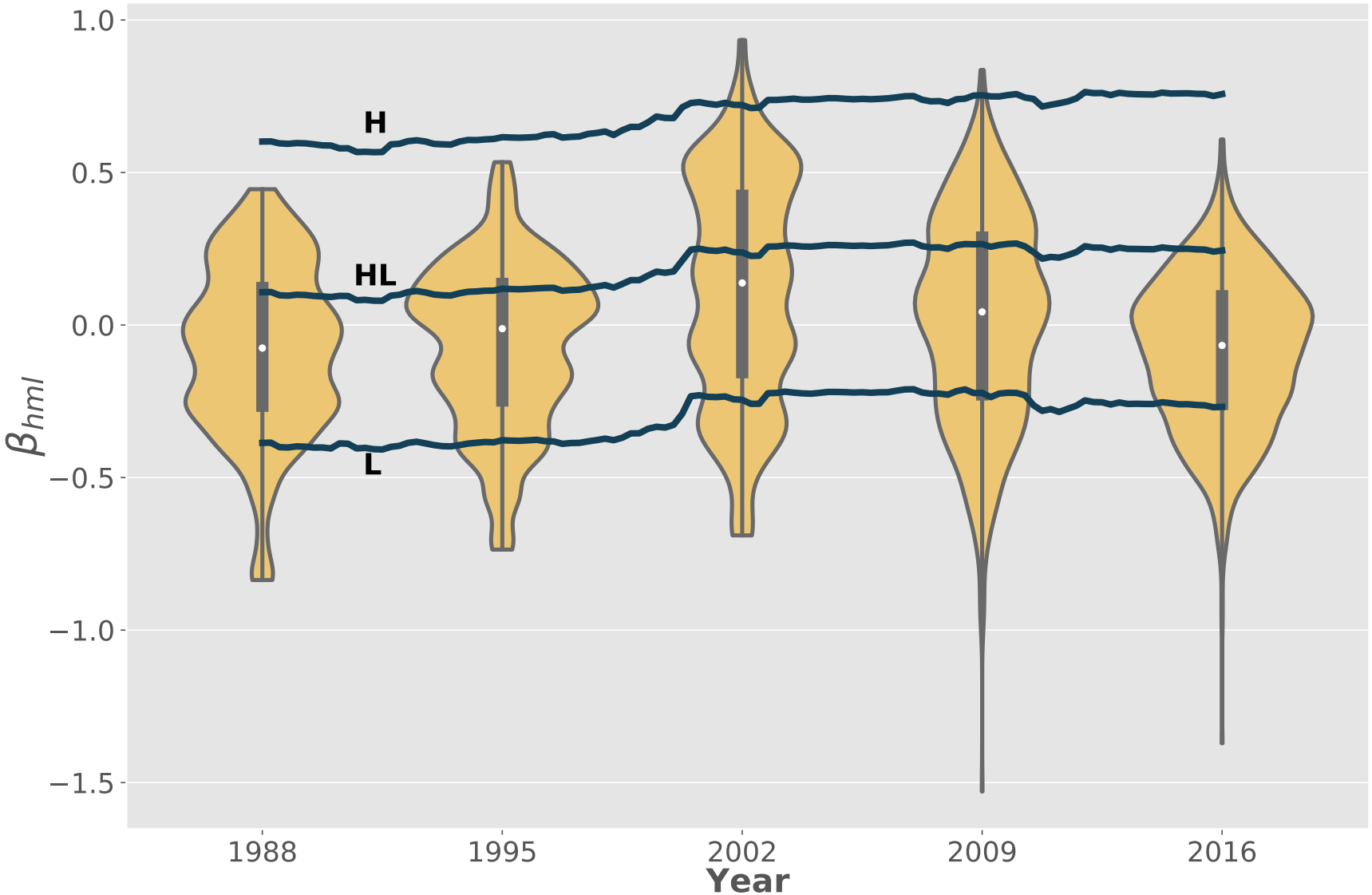
$\beta_{X,HML}$	BM1	BM2	BM3	BM4	BM5
ME1	-0.41	0.02	0.26	0.49	0.70
ME2	-0.45	0.06	0.41	0.61	0.82
ME3	-0.45	0.16	0.42	0.60	0.79
ME4	-0.42	0.21	0.42	0.50	0.72
ME5	-0.33	0.12	0.31	0.64	0.62

Magnitudes of β's are only meaningful in context with $\beta_{L,HML}$ and $\beta_{H,HML}$!

Distribution of MF HML-β's over time



Distribution of MF HML-β's over time



Distribution of MF HML-β's

- HML-β's varies over time:
  - 1991Q3: $\beta_{H,HML} = 0.57$, 2012Q2: $\beta_{H,HML} = 0.76$
  - 1991Q4: $\beta_{L,HML} = -0.41$, 2007Q2: $\beta_{L,HML} = -0.21$
- Median of MF HML-β's varies between -0.08 in 1988 and 0.14 in 2002
- Median HML-β is close to 0 $\Rightarrow$ MF are on average BM-neutral?
- NO! Majority of MFs have HML-β's that are lower than the HML-β of (H+L)/2
- Many MFs with HML-β's close to $\beta_{L,HML}$
- But (very) few with a HML-β close to $\beta_{H,HML}$
- Distribution of MF HML-β confirms absence of high-BM "Value" funds