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

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Introduction

- Large literate on **performance** of active mutual funds: Skill?
- Academic literature: 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
  - Paper and talk: Size, value/growth, momentum
  - Appendix: Investment, profitability, ...
- In addition: ETFs, hedge fund portfolios (more limited data)

Mutual fund portfolios and factors

- **Broader question**: What determines the set of MFs available to investors?
  - Supply? Demand?
  - Does strategy/skill/expertise of MF managers attract capital?
  - Do investors have preferences over strategies/styles and investment managers create funds to satisfy demand?
- MFs account for 24% of mkt cap → **Effect of MF portfolio holding son prices**?
- **Do MFs contribute to factor premia or trade against them?**

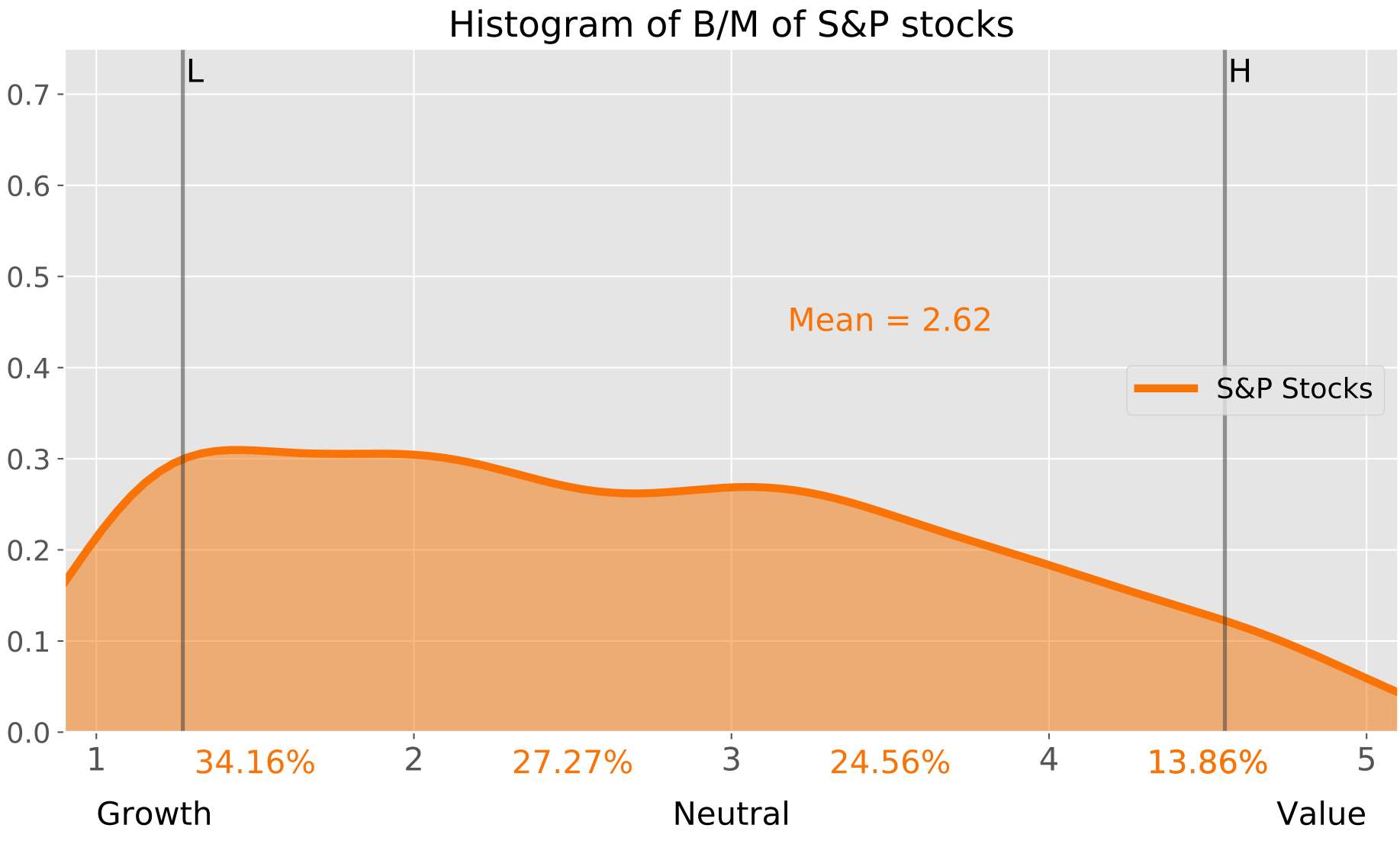
Example: Distributions of BM of S&P500 stocks and mutual funds

- Sort stocks into 5 BM quintiles using FF breakpoints
- Assign stock s in month t the quintile score $Q^{BM}_{s,t} \in \{1, 2, 3, 4, 5\}$
- For each MF m in month t, construct the portfolio-weighted BM

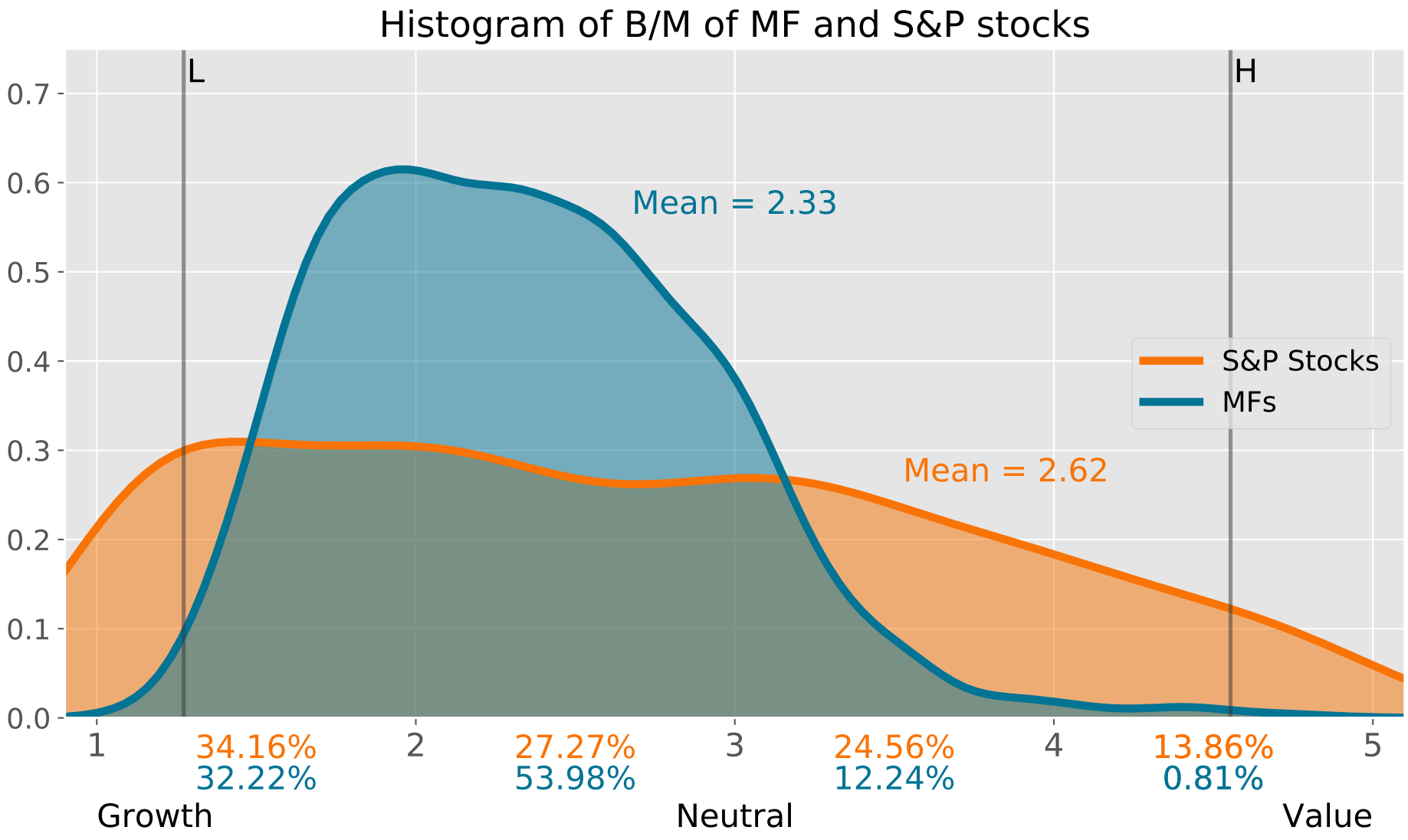
$$BM_{m,t} = \sum_{s \in S_t} \omega_{m,s,t} \, Q^{BM}_{s,t}$$

- $BM_{m,t} = 1$: MF that holds only stocks in **lowest** BM quintile $\longrightarrow$ **"Growth"** MF
- $BM_{m,t} = 5$: MF that holds only stocks in **highest** BM quintile $\longrightarrow$ **"Value"** MF
- Compare distribution of BM of S&P stocks and MFs
- Benchmarks: "H" and "L" used in construction of HML

Example: Distribution of BM of mutual funds



Example: Distribution of BM of mutual funds



⇒ **Where are the high-BM Value funds?**

Outline

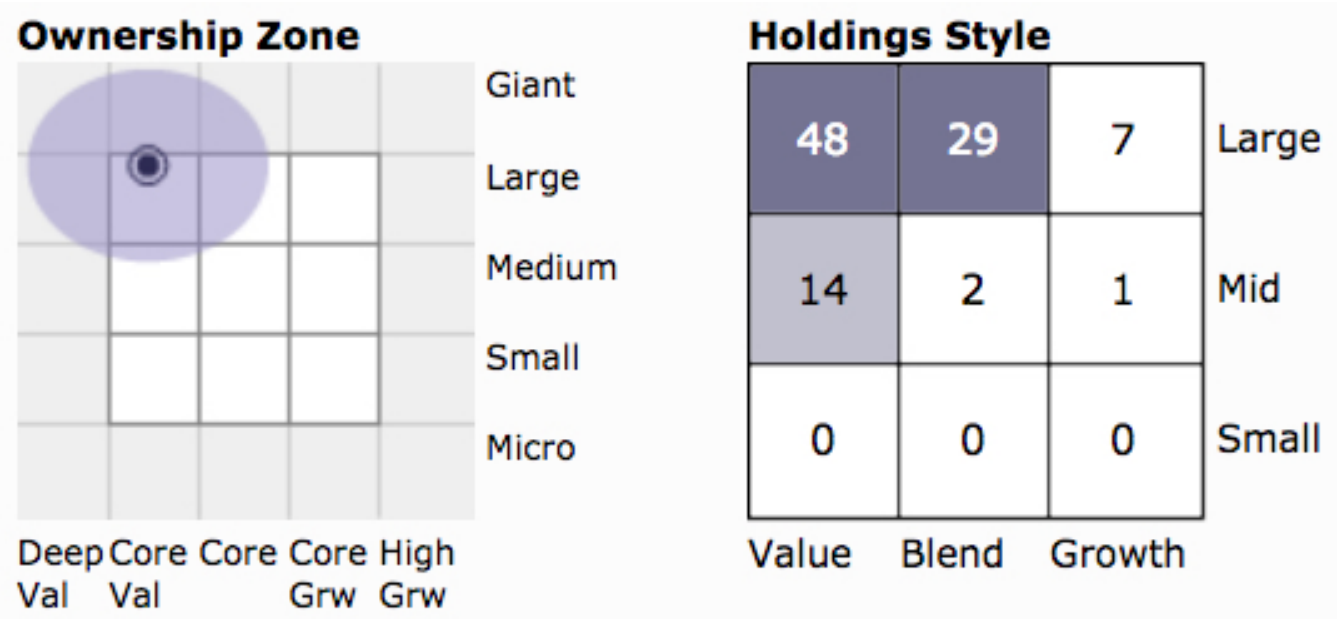
- MFs disclose their portfolio holdings to the SEC at the end of each quarter
- For each MF/quarter, we construct characteristics of its portfolio:
  Size, BM, momentum, other "value/growth"measures
- Paper and online appendix: investment, ROE, ...
- The we study:
  1. Cross-sectional distribution of characteristics across MFs
  2. Composition of MF portfolios
  3. Joint distribution of MF characteristics
  4. Characteristics over time
  5. MF characteristics and performance
  6. Holdings vs. (regression) loadings

Mutual fund portfolios

- CRSP/Thompson-Reuters fund/quarter level portfolio holdings
- Sample: 1980Q1 to 2016Q4, 2,638 mutual funds, 955 ETFs
- Fund objectives: 574 "Value" and 1,230 "Growth" funds
- Measuring fund characteristics: 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 $\in [1, 5]$
     - Robust to outliers but depends on breakpoints
  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
- Same procedure for size (ME), momentum (MOM), E/P, D/P, ROE, INVEST, ...

Morningstar's Value/Growth Measure

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



How does Morningstar define "Value" and "Growth"?

Morningstar's value/growth measure

Combination of price multiples and growth variables:

$$\text{Mult} = \frac{1}{2}\,\frac{E(Earn)}{P} + \frac{1}{2}\,\text{avg}\left(\frac{B}{P}, \frac{S}{P}, \frac{CF}{P}, \frac{D}{P}\right)$$

$$\text{Growth} = \frac{1}{2}\,E(\Delta LTE) + \frac{1}{2}\,\text{avg}\,(\Delta E, \Delta S, \Delta CF, \Delta B)$$

$$\text{MS}[-100, 100] = \text{scaled Mult}[0, 100] - \text{scaled Growth}[0, 100]$$

- We construct MS for each stock and each MF in our sample
- The Morningstar Value/Growth measure plays an important role in the fund industry, especially for ETFs

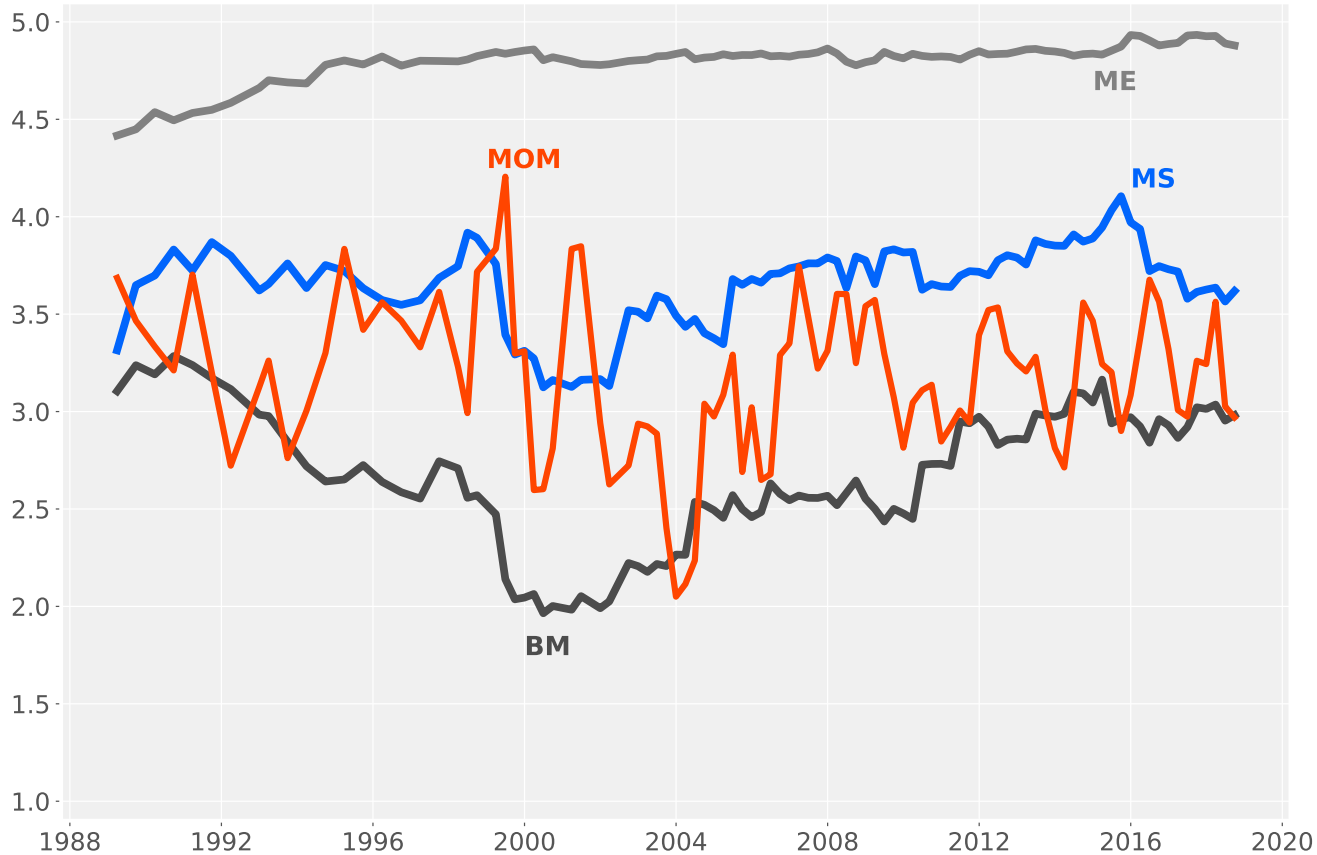
Hedge funds

- Individual hedge funds do not report their holdings
- Hedge Fund Research and other databases: **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 firm 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!

Sample

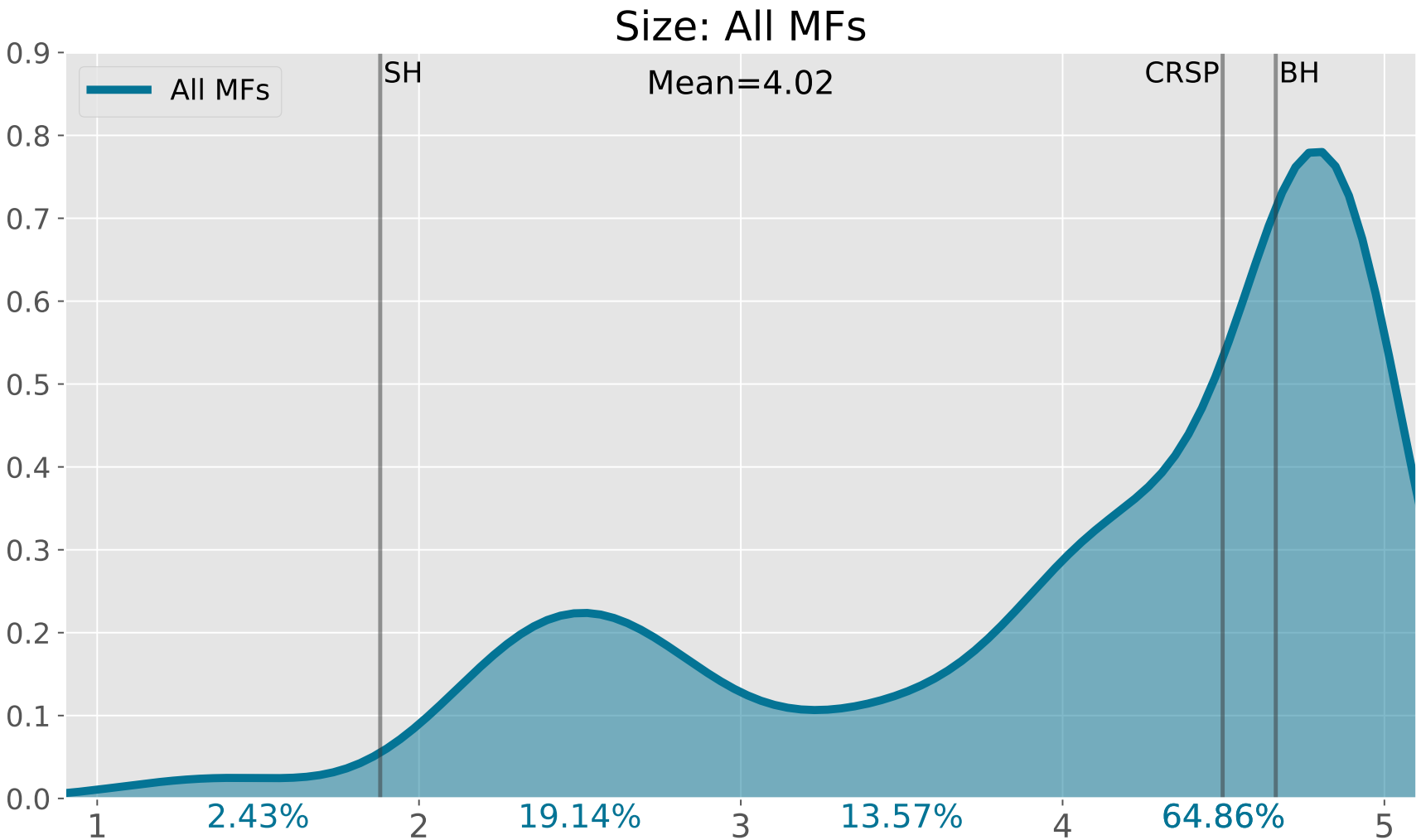
	Mutual Funds				ETFs	HFs
	All	Value	Growth	Other		
Number of funds	2,638	574	1,130	934	955	114
AUM 12/2014 ($ bil.)	2,143	416	927	799	1,124	53
Median size ($ mil.)	149	145	150	150	167	NA
Median age (years)	11.58	9.88	11.83	12.56	5.42	NA
Median no. of stocks	54	56	51	56	99	64
Median Return over S&P 500	-0.70%	-0.41%	-0.74%	-0.81%	0.76%	NA
Median 4-Factor α	-0.35%	-0.04%	-0.45%	-0.41%	-0.36%	NA

Example: Largest "Value" fund – T Rowe Price Equity Income Fund (PRFDX)

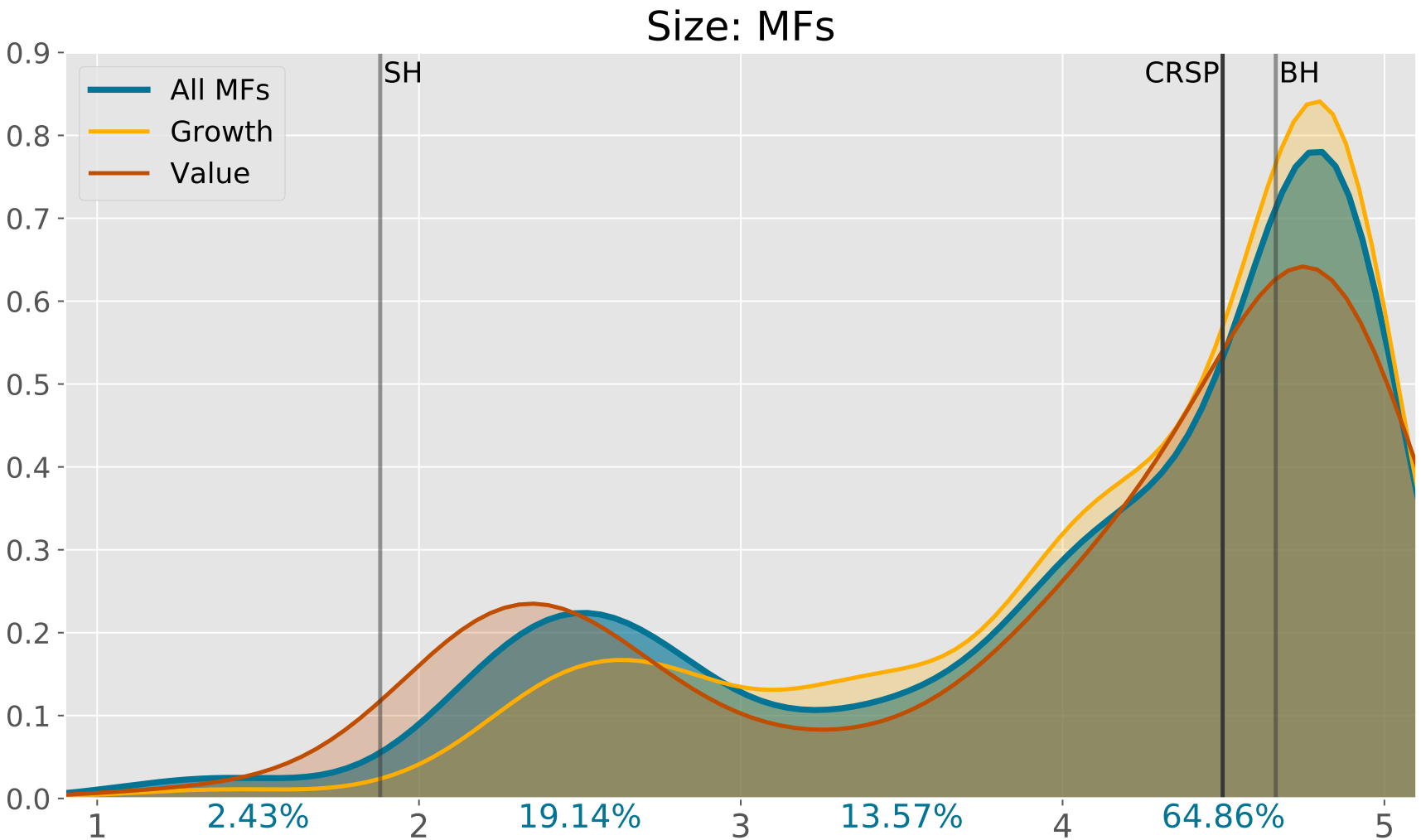


- ME, BM and MS are persistent, MOM changes quarter to quarter
- Value/growth measures are often different, for PRFDX: MS > BM

Mutual fund characteristics: Size (ME)



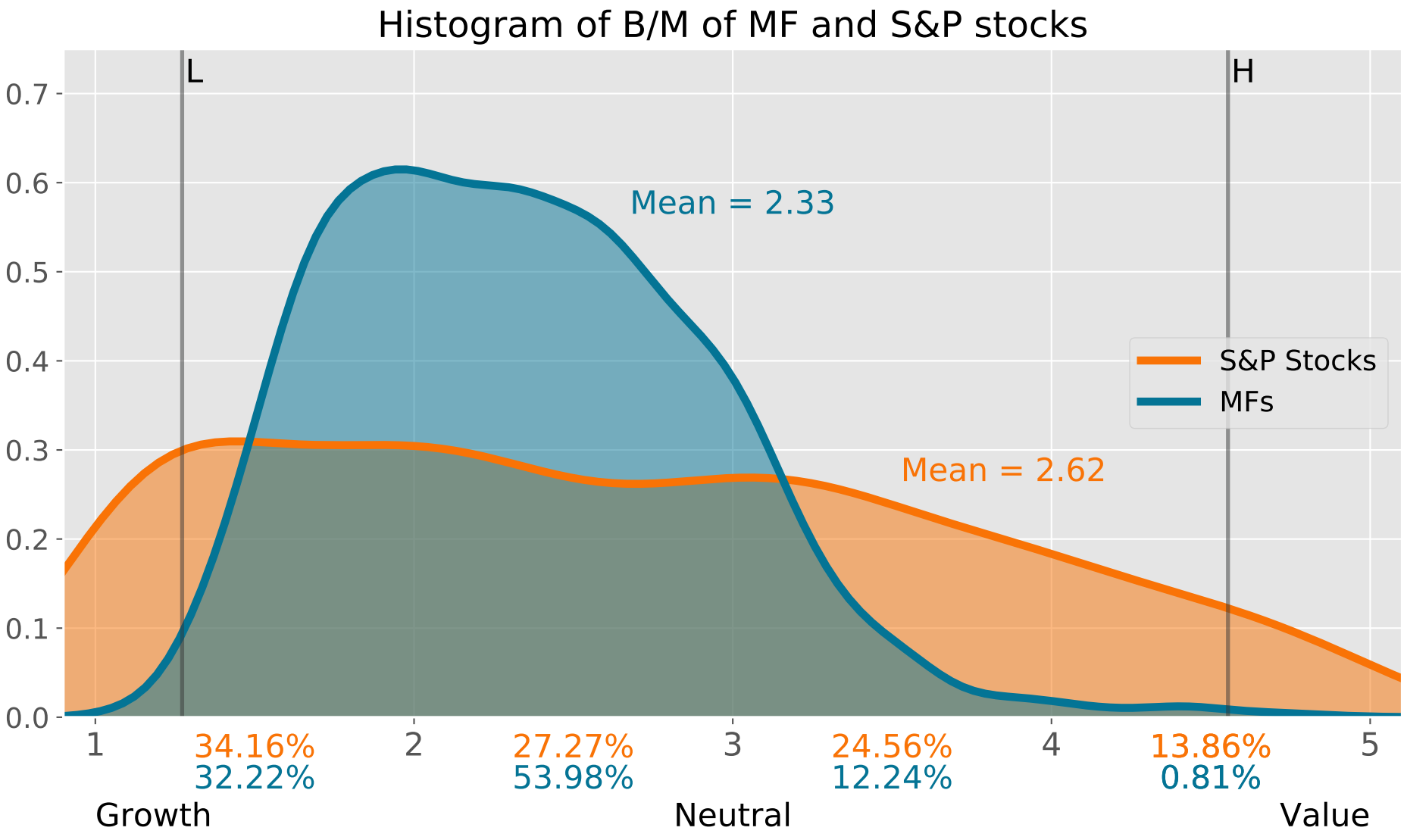
Mutual fund characteristics: Size (ME)



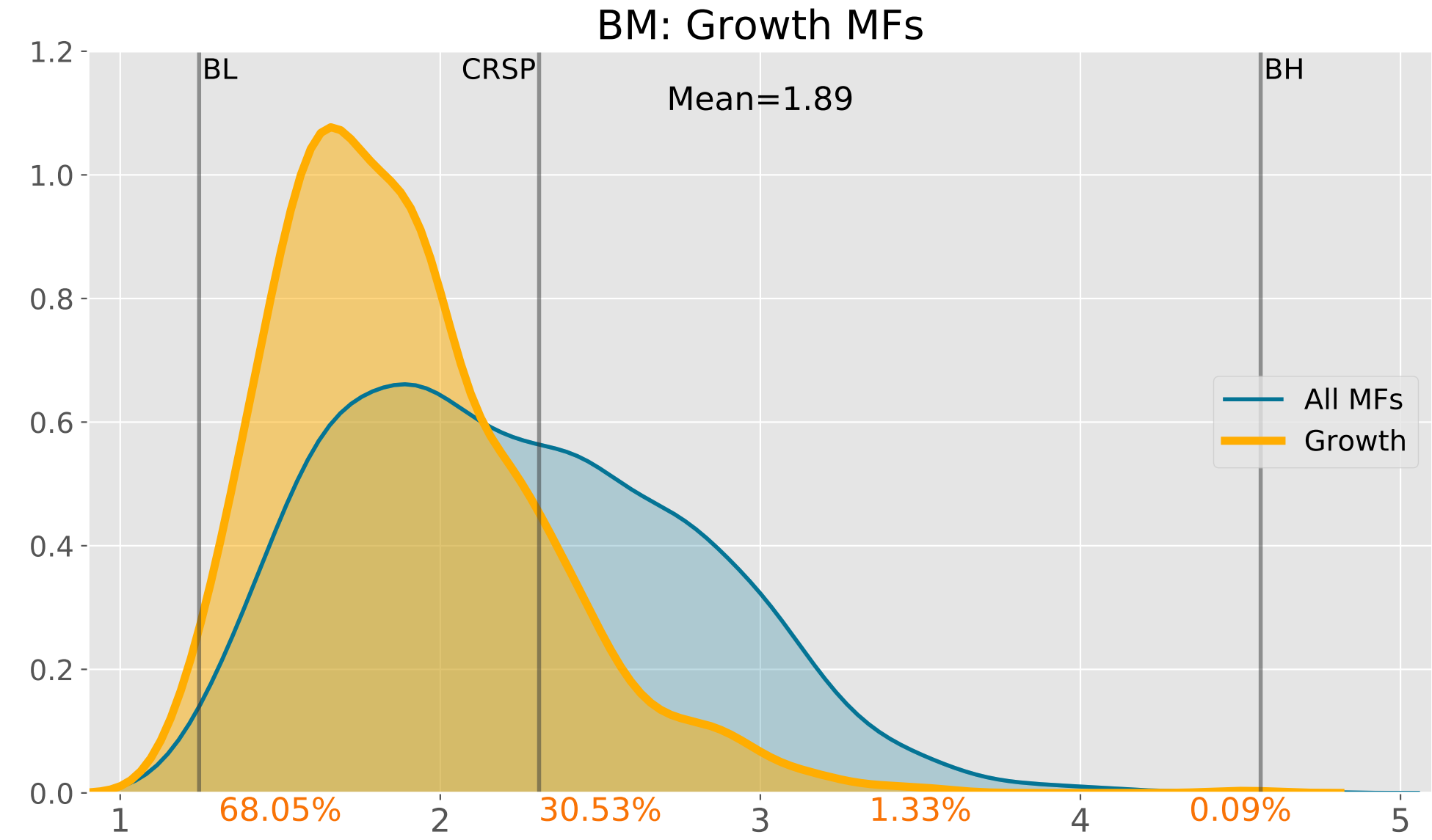
Mutual fund characteristics: Size (ME)

- Most MFs hold very large stocks
- **65% of all MFs have ME score between 4 and 5**
- 14% have ME score between 3 and 4
- 19% have ME score between 2 and 3
- Only 2% have ME score between 1 and 2
- FF "Small" portfolio has an ME score of 1.8, only 2% of all MFs have a lower ME score
- Investors: "Small" portfolio is difficult to replicate using MFs
- Similar patterns for "Growth" and "Value" funds

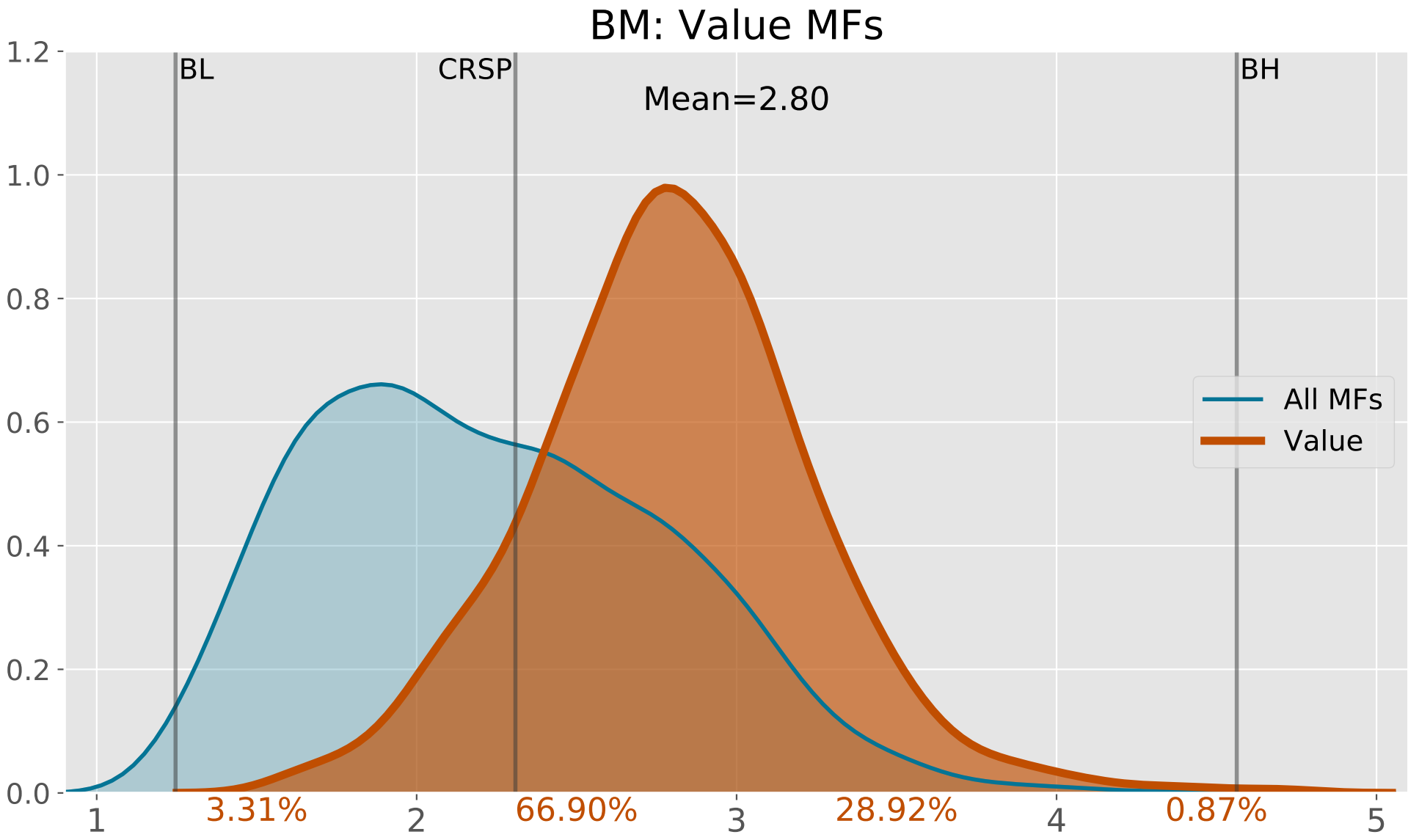
S&P500 Stocks characteristics: BM



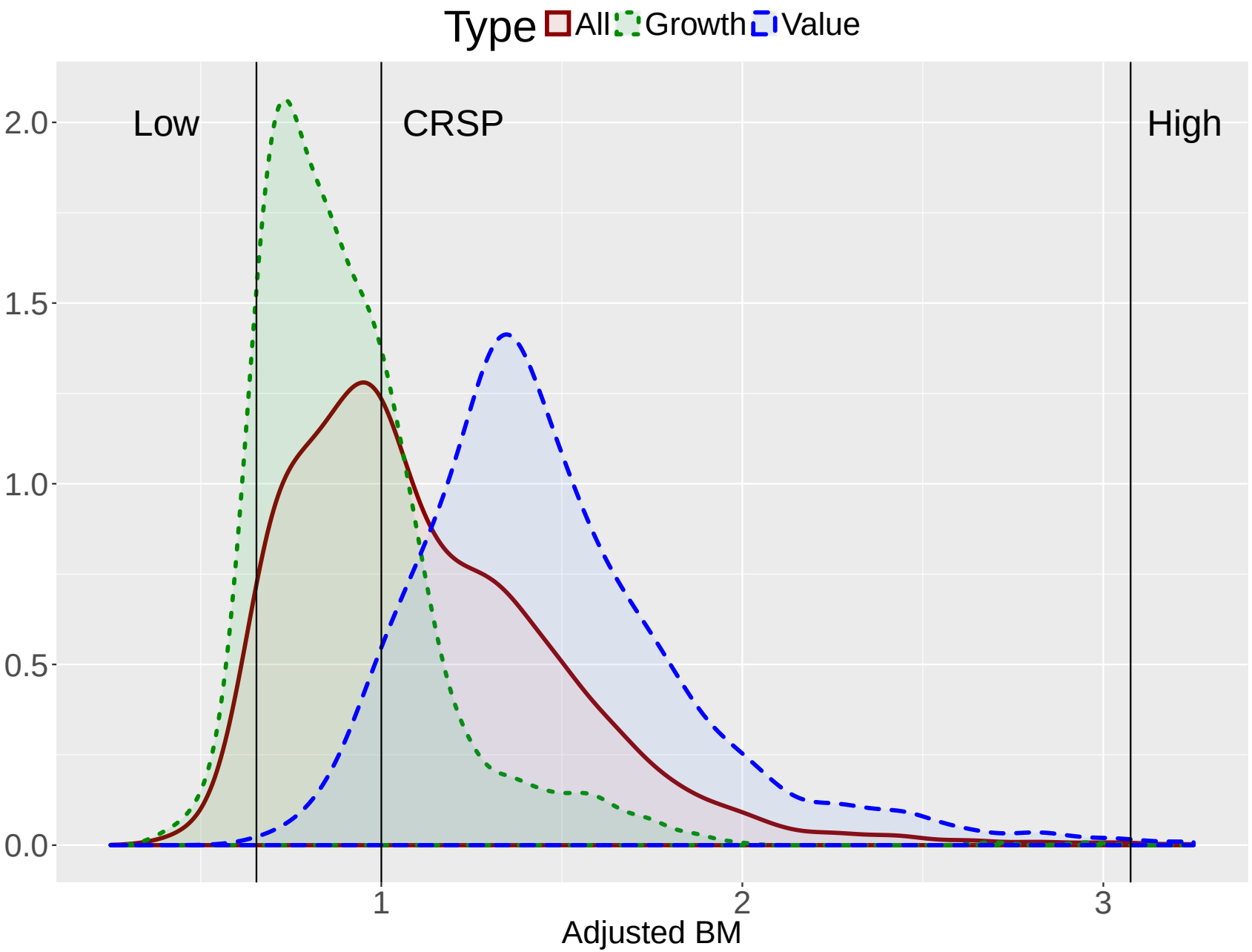
Mutual fund characteristics: BM



Mutual fund characteristics: BM



Mutual fund characteristics: Market-adjusted BM



Mutual fund characteristics: BM

- MF BM distribution is left-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

Other growth/value measures

Recall: Morningstar index MS is comprised of multiples and fundamental growth rates

$$\text{MULT} = \frac{1}{2}\,\frac{E(Earn)}{P} + \frac{1}{2}\,\text{avg}\left(\frac{B}{P}, \frac{S}{P}, \frac{CF}{P}, \frac{D}{P}\right)$$

$$\text{GROWTH} = \frac{1}{2}\,E(\Delta LTE) + \frac{1}{2}\,\text{avg}\left(\Delta E, \Delta S, \Delta CF, \Delta B\right)$$

$$\text{MS}[-100, 100] = \text{scaled Mult}[0, 100] - \text{scaled Growth}[0, 100]$$

Next: MF distribution of all MS components

Morningstar MS: Multiples MULT

Characteristic	Mutual Funds				Stocks			
	[1-2]	[2-3]	[3-4]	[4-5]	[1-2]	[2-3]	[3-4]	[4-5]
MS	33%	43%	24%	1%	28%	27%	27%	18%
BM	40%	51%	9%	0%	34%	28%	24%	14%
EP	15%	61%	24%	0%	27%	34%	27%	13%
CFP	20%	58%	22%	0%	25%	35%	25%	15%
DP	18%	42%	36%	4%	28%	21%	30%	21%
SP	37%	58%	5%	0%	34%	27%	23%	16%

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

Morningstar MS: Fundamental growth rates GROWTH

Characteristic	Mutual Funds				Stocks			
	[1-2]	[2-3]	[3-4]	[4-5]	[1-2]	[2-3]	[3-4]	[4-5]
GR	0%	29%	50%	21%	12%	38%	29%	21%
GRLTE	1%	37%	45%	17%	16%	35%	28%	22%
GRE	0%	14%	85%	0%	2%	43%	51%	4%
GRB	0%	17%	83%	1%	6%	42%	44%	8%
GRS	0%	19%	79%	2%	5%	43%	42%	10%
GRCF	0%	9%	91%	0%	3%	40%	53%	4%

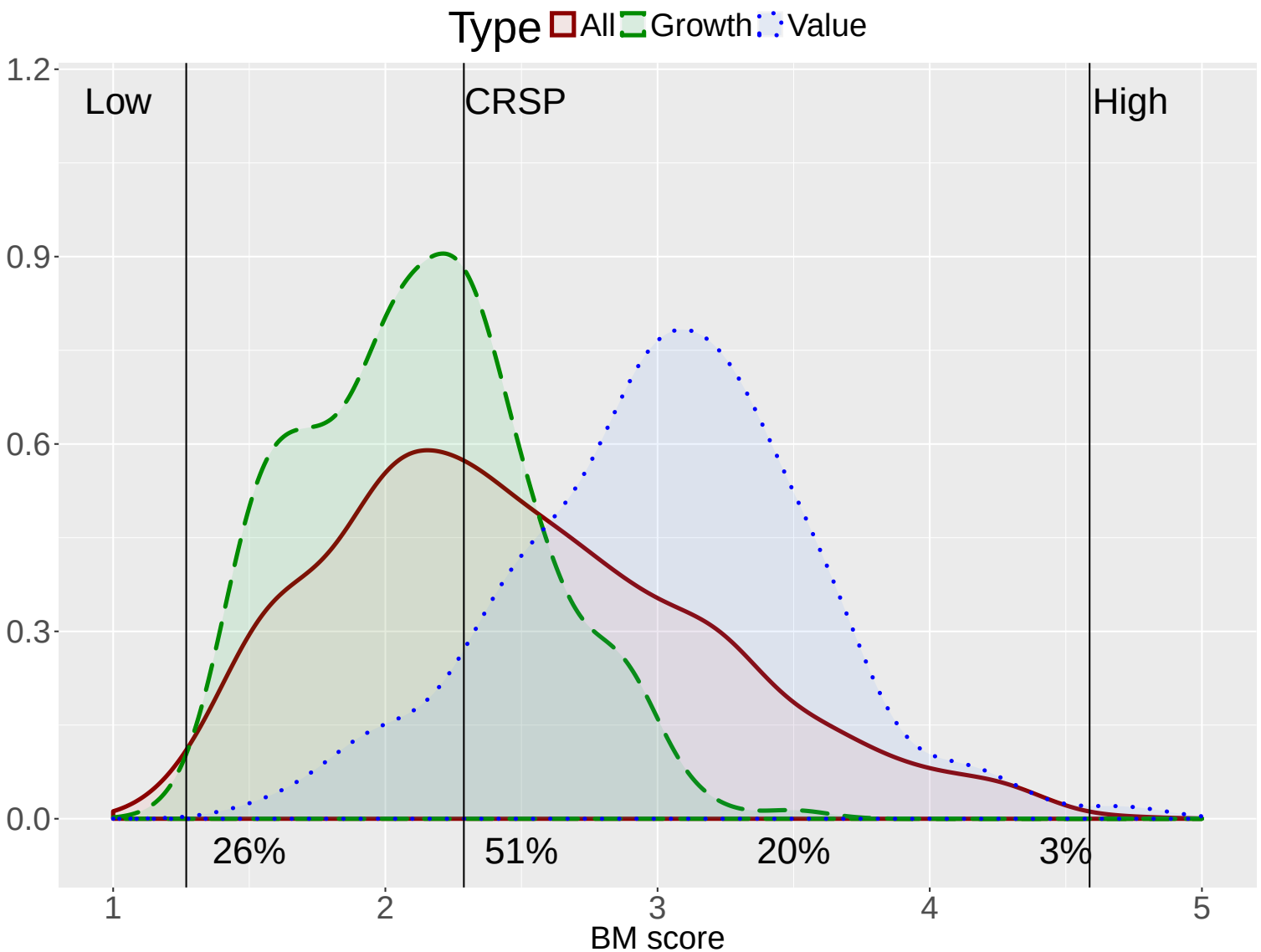
The MF distributions of fundamental growth rates are similar to the distributions of S&P 500 stocks

The case of the 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

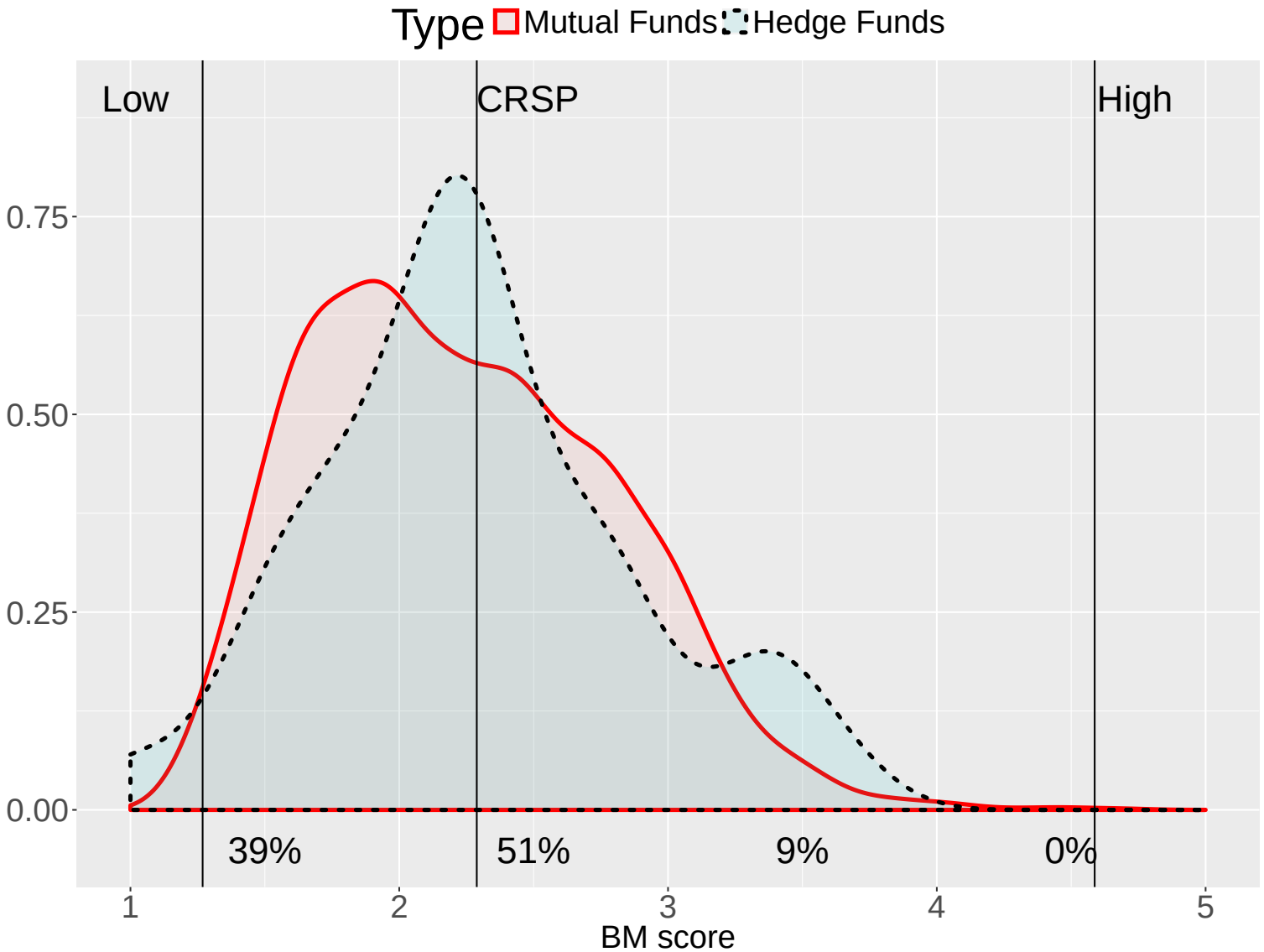
*: sub-advised by DFA

BM DISTRIBUTION OF ETFs



Mostly low-BM ETFs, very few high-BM ETFs

BM distribution of Hedge Funds



BM distribution of HFs similar to that of MFs

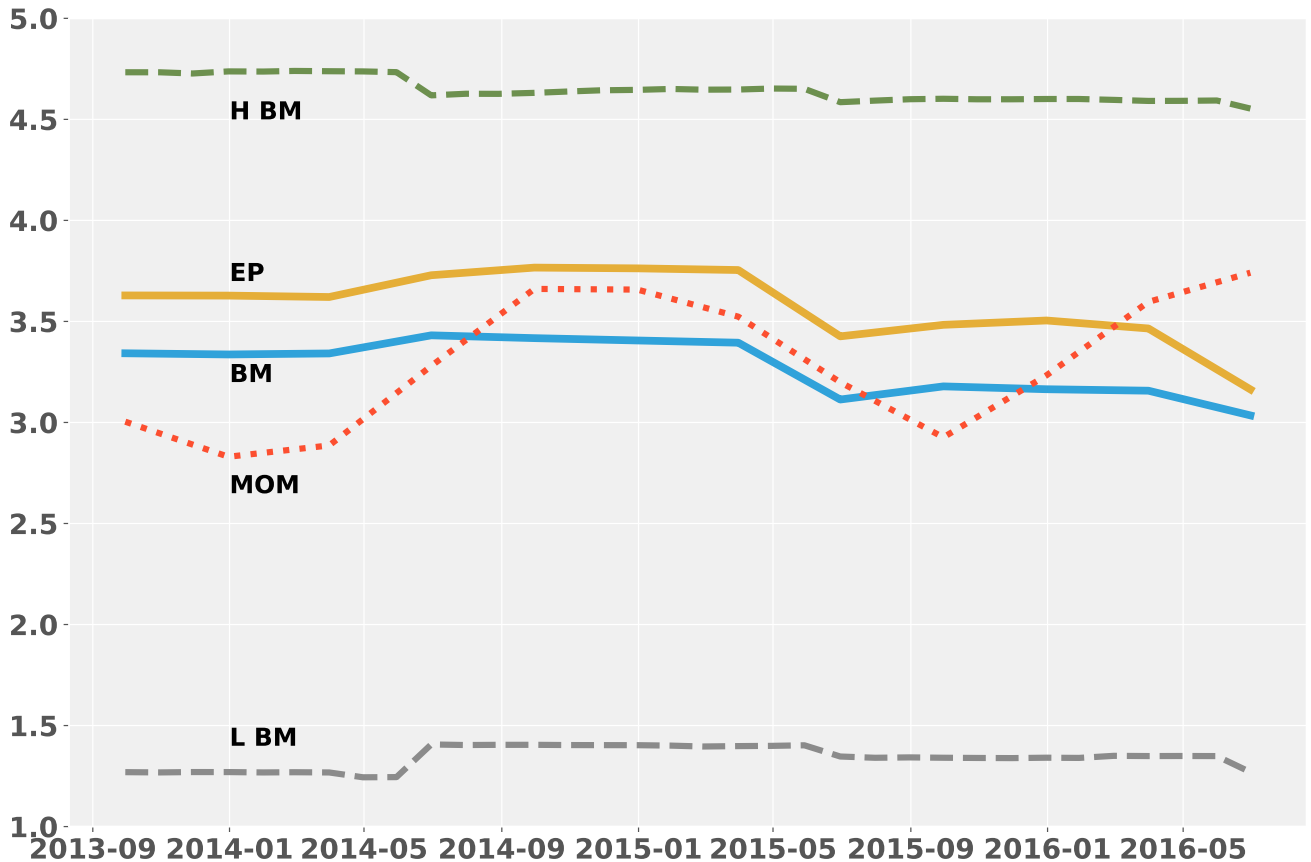
ETFs with BM>4 (AUM>$100 mil.)

Fund	BM	MS	MOM	ME	Size (mil.)
First Trust Utilities AlphaDEX Fund	4.39	4.29	3.14	4.27	310.31
iShares US Insurance ETF	4.38	4.18	3.38	4.54	104.20
PowerShares KBW Bank Portfolio	4.32	4.30	3.25	4.75	214.27
Fidelity MSCI Utilities Index ETF	4.30	4.31	3.51	4.51	124.84
PowerShares Global Listed Private Equity	4.29	3.25	3.11	3.00	403.50
SPDR S&P Insurance ETF	4.29	4.11	3.43	4.24	285.51
Utilities Select Sector SPDR Fund	4.23	4.52	3.29	4.82	5875.74
iShares Global Utilities ETF	4.23	4.52	3.30	4.82	222.35
Guggenheim S& P SmallCap 600 Pure Value ETF	4.21	3.49	2.80	1.53	120.25
Vanguard Utilities Index Fund	4.17	4.37	3.33	4.51	1363.68
iShares US Utilities ETF	4.17	4.36	3.34	4.57	780.34
SPDR S&P Bank ETF	4.08	3.82	3.12	4.04	2029.98
Guggenheim S&P 500 Pure Value ETF	4.06	4.23	3.11	4.51	464.45
iShares Global Financials ETF	4.01	3.94	3.21	4.93	248.72
Financial Select Sector SPDR Fund	4.00	3.94	3.20	4.93	12563.70

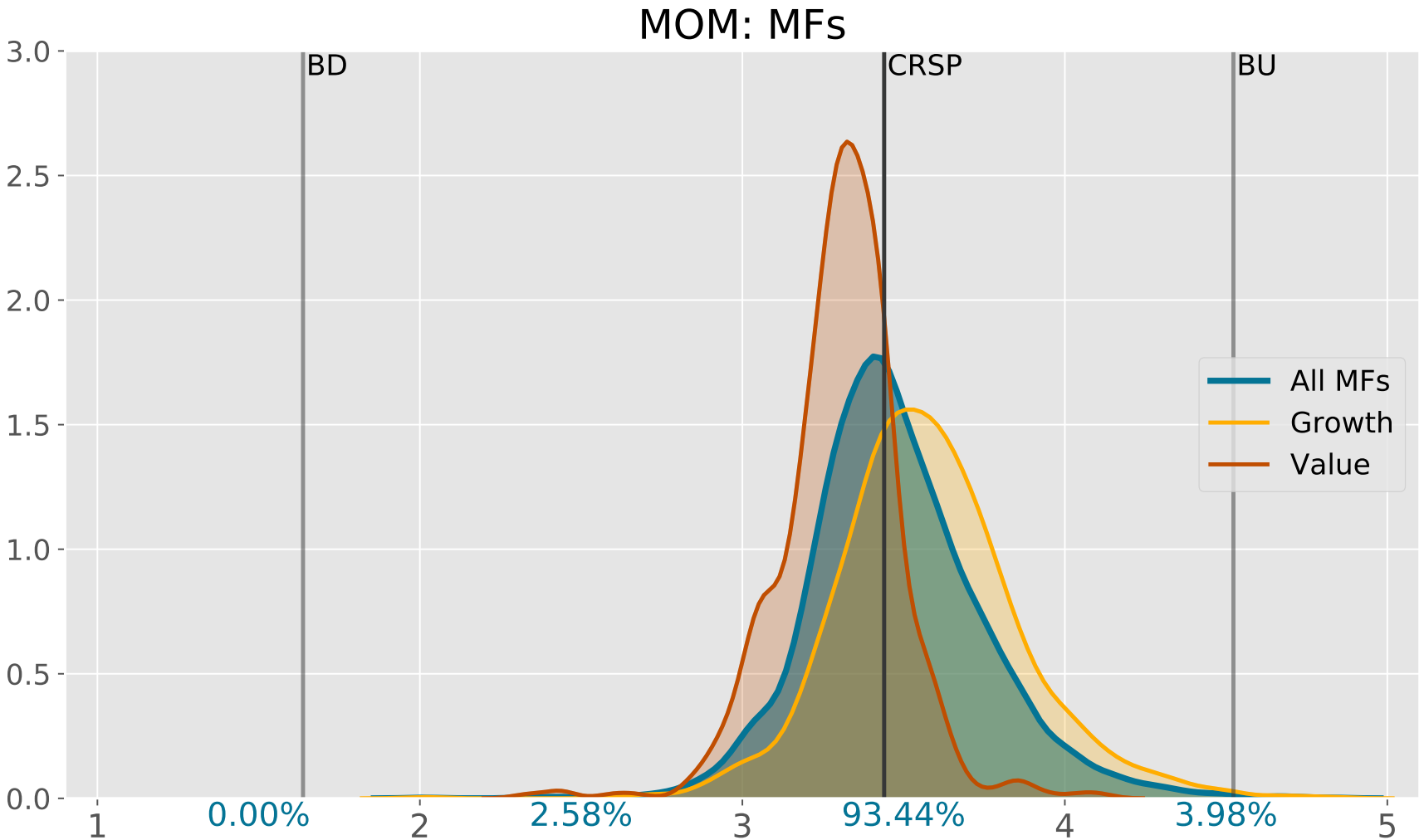
- High BM ETFs are mostly **industry**-funds
- Very few **true value**-funds

Example: iShares Russell 1000 Value

- Most value/growth 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."



Mutual fund characteristics: Momentum



Mutual fund characteristics: Momentum

- MOM distribution of MFs concentrated between 3 and 4
- Mutual funds have slightly higher average MOM than S&P stocks
- MOM of “Growth” funds slightly higher than MOM of “Value” funds
- Note: Larger time series variation of MOM scores than of other characteristics
- Very few mutual funds have consistently MOM scores > 4

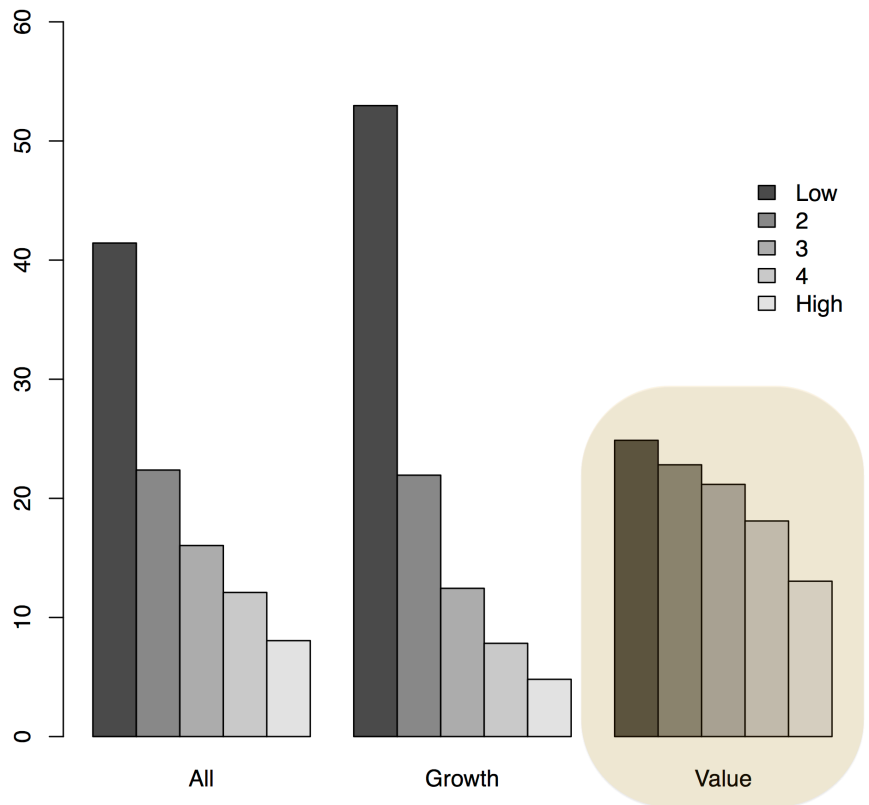
A CLOSER LOOK AT MUTUAL FUNDS PORTFOLIOS

- 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%

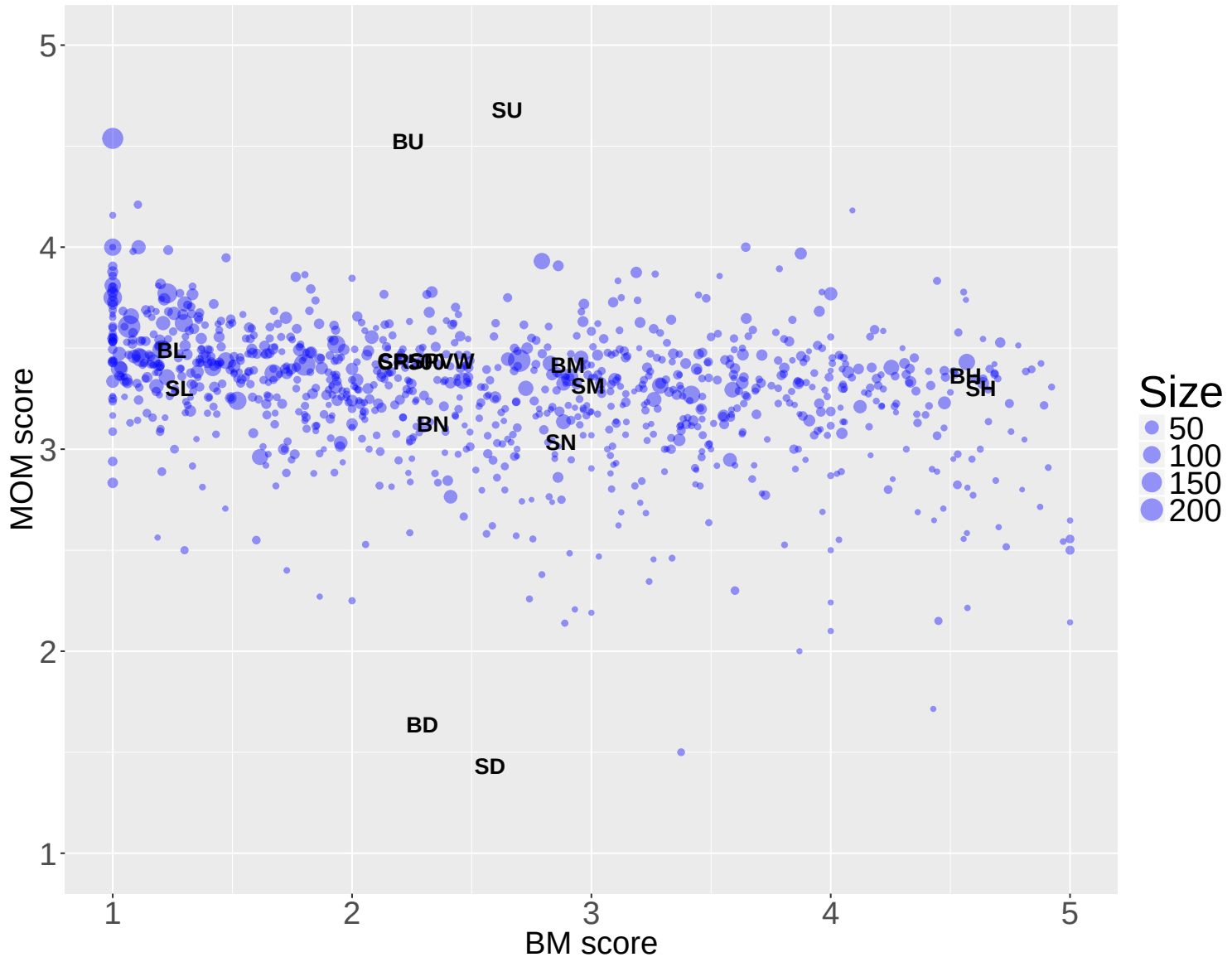
- 4 of 5 largest "Value" MFs: **More (low) BM1 stocks than (high) BM5 stocks**

A CLOSER LOOK AT MUTUAL FUNDS PORTFOLIOS: BM QUINTILES

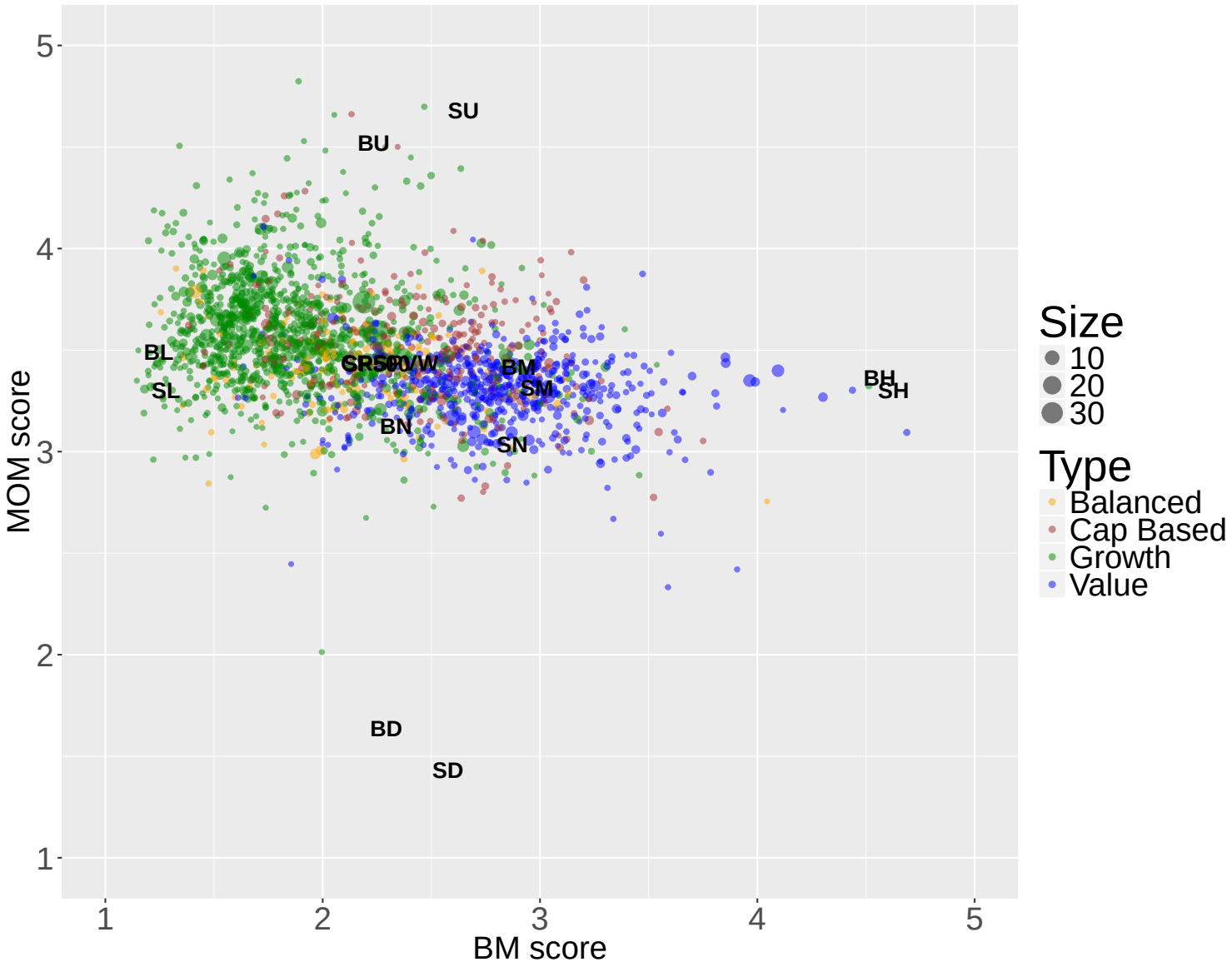


- Portfolios of "Growth" MFs are concentrated on low BM stocks
- **"Value" MFs invest larger share in low BM stocks than in high BM stocks**
- Next: Joint BM and MOM distribution

BM/MOM distribution: Stocks



BM/MOM DISTRIBUTION: MUTUAL FUNDS



BM/MOM distribution: HFs and ETFs

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

Mutual fund characteristics and return: 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

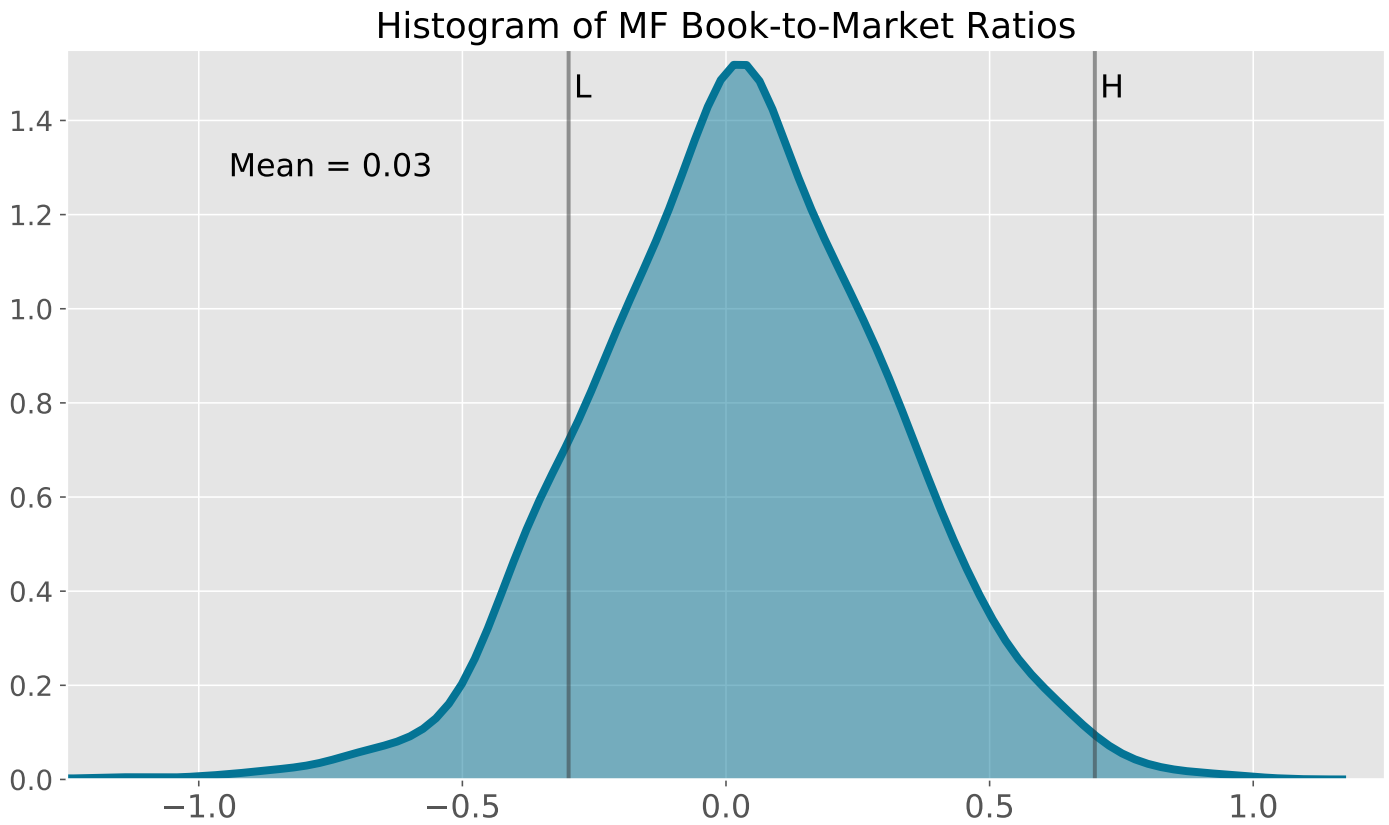
Holdings vs. loadings

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 $PMQ_t = P_t - Q_t$; regressions for $Y \in \{P, Q\}$:

$$Y_t = \alpha_Y + \beta_{Y,PMQ}\, PMQ_t + e_{Y,t}$$

$$PMQ_t = P_t - Q_t \implies \beta_{P,PMQ} - \beta_{Q,PMQ} = 1$$

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

- The magnitudes of β's depend on the **relative volatilities** of P and Q
- 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: $\beta_{S,SMB} = 1.60 > \beta_{B,SMB} = 0.60 > 0$!
- MF with $\beta_{SMB} = 1.7$ and $\beta_{HML} = 0$ is a small/growth fund!

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]′

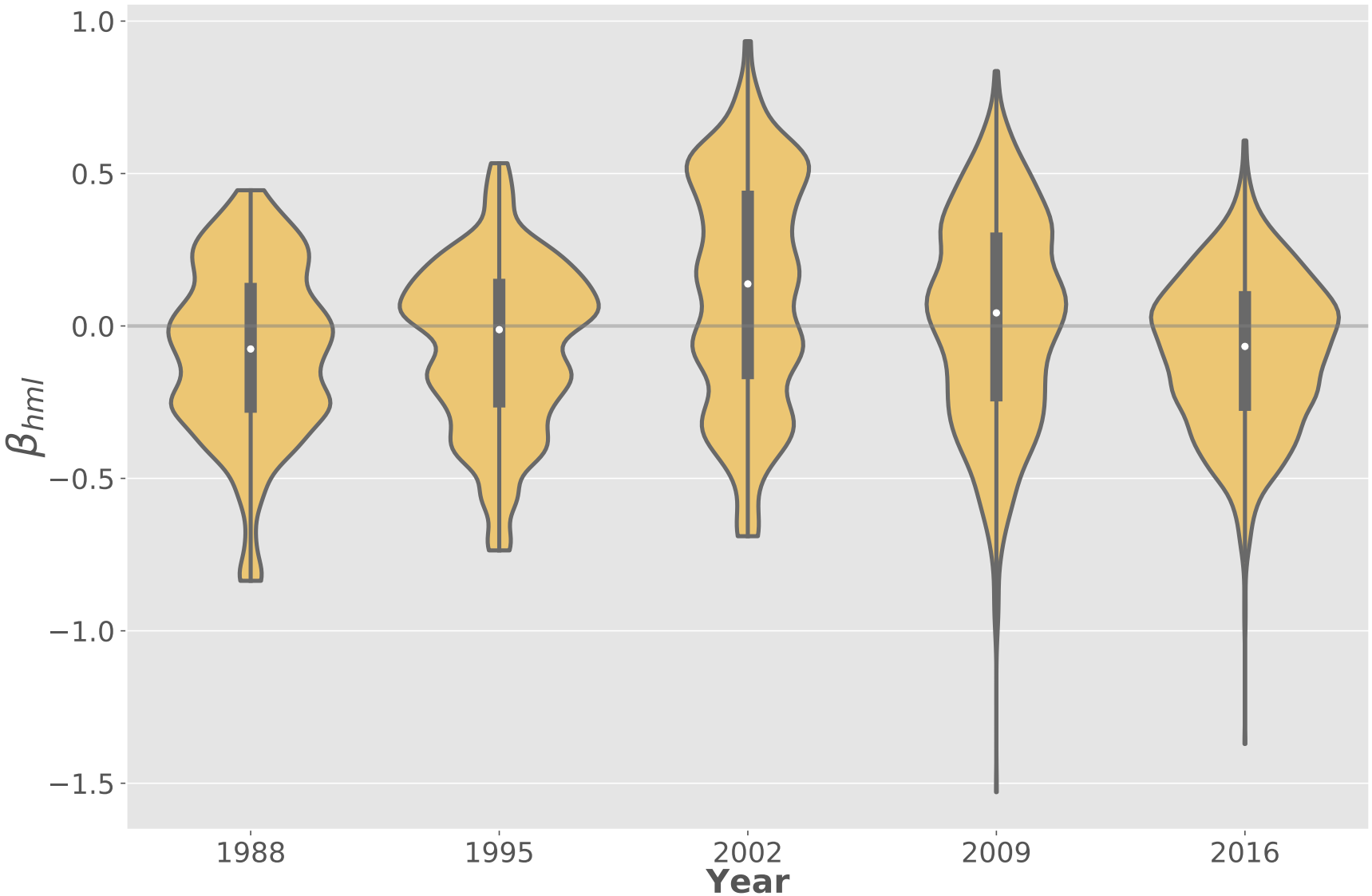
$$X_t = \alpha_X + \beta_{XMKT}\, MKT_t + \beta_{XSMB}\, SMB_t + \beta_{i,HML}\, HML_t + e_{X,t}$$

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

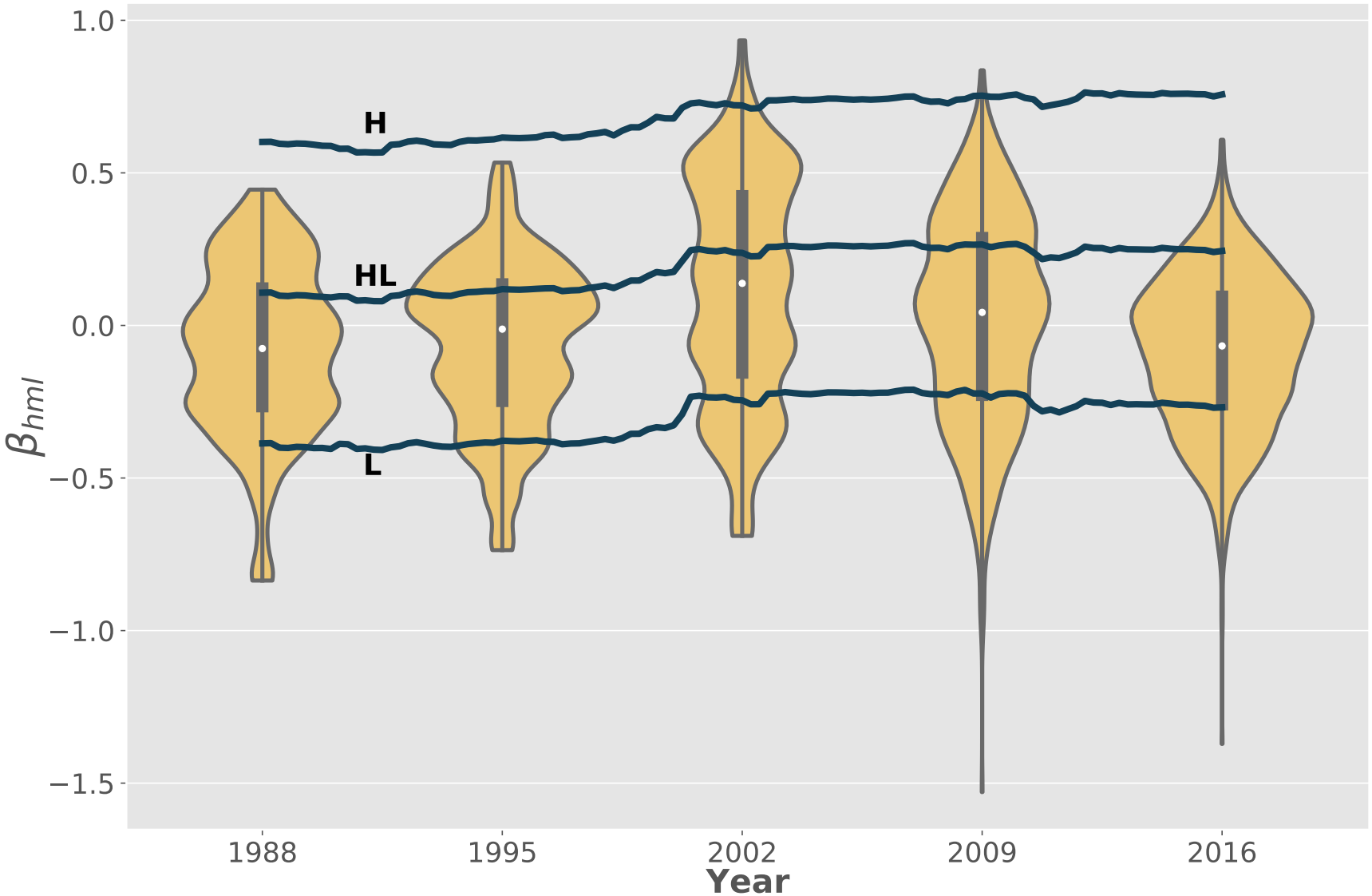
$\beta_{X,HML}$	BM1	BM2	BM3	BM4	BM5
ME1	-0.41	0.02	0.26	0.49	0.70
ME2	-0.45	0.06	0.41	0.61	0.82
ME3	-0.45	0.16	0.42	0.60	0.79
ME4	-0.42	0.21	0.42	0.50	0.72
ME5	-0.33	0.12	0.31	0.64	0.62

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

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?