# The beta of the value factor beta predicts the value premium

Nigel J. Barradale and Soeren Hvidkjaer

Copenhagen Business School

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# Background

- Many firm value/growth-related characteristics predict cross-sectional stock returns:
  - B/M, P/E, long-term price changes, level of investment, level of external financing, asset growth etc.
- The standard rational explanation is that such predicability reflects differences in risk
- The standard sub-rational explanation is that naïve investors have excess demand (driven by preferences or biased information processing) for stocks with certain characteristics ("glamour stocks"). This leads to overpricing in the current period and low future returns, as prices revert to fundamental values. Conversely for value stocks, as these are shunned by investors.

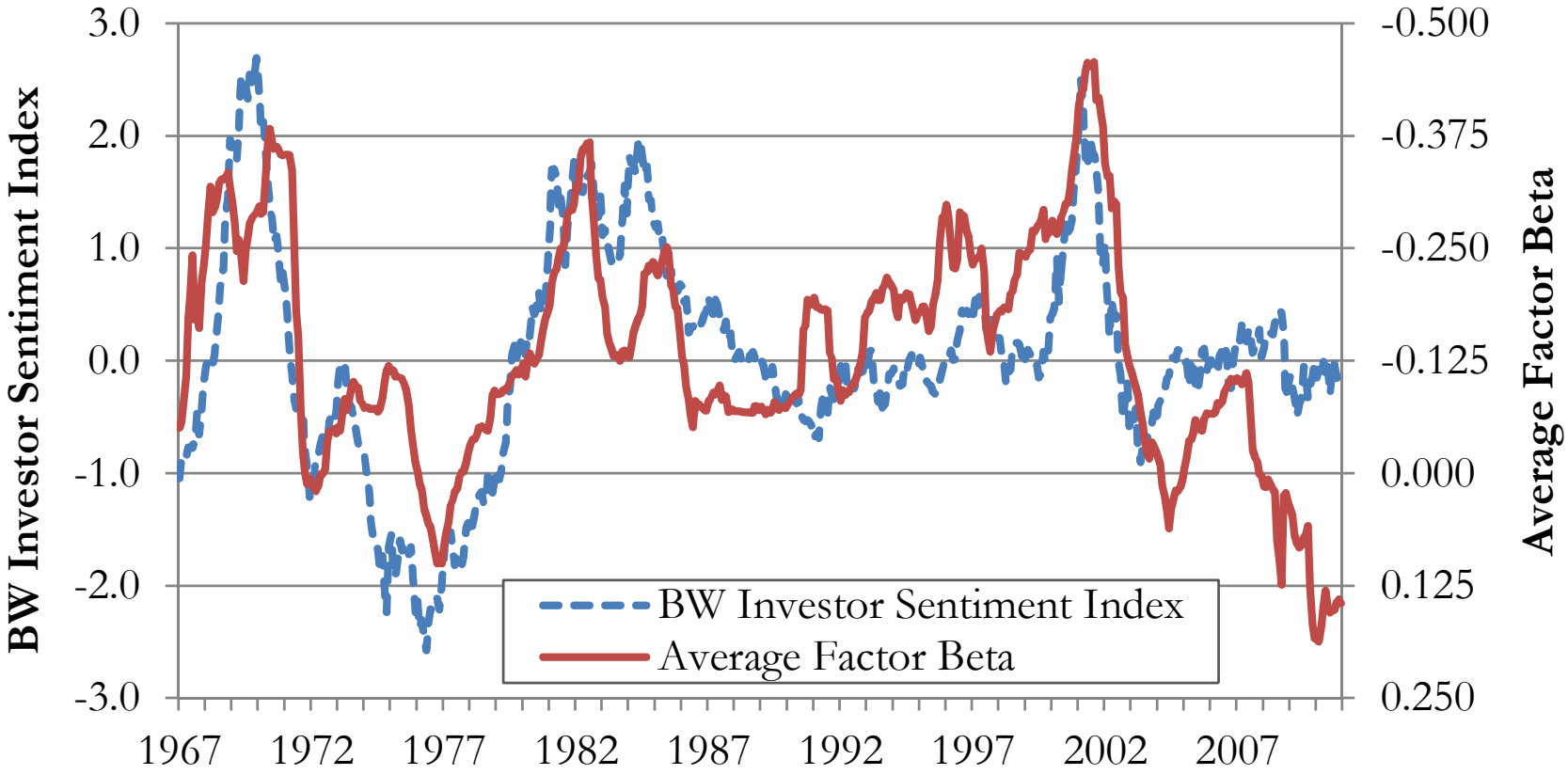
# A first look at risk: Betas

- We examine long-short factor portfolios based on seven different value-related characteristics previously shown to predict returns
  - As the growth/glamour stocks underperform, they are in the short leg
  - As the value/neglected stocks outperform, they are in the long leg
  - The beta of the factor portfolio is thus the beta of the value stocks minus the beta of the growth stocks
- Finding: All factor portfolios exhibit negative betas
  - Inconsistent with the CAPM predicting a positive relationship between beta and average returns

# The dynamics of factor betas

- This could be reconciled with the CAPM framework if the beta and expected return co-move positively. I.e., value stocks could have unconditionally low betas in the cross-section if, conditional on the betas being high in the time-series, the expected returns are also high.
- This is our main test.
- We find that rather than co-moving positively, the beta of value factor portfolios *negatively* predicts future returns. The contradiction is worsened.
- Is this consistent with the behavioral explanation for the value premium?

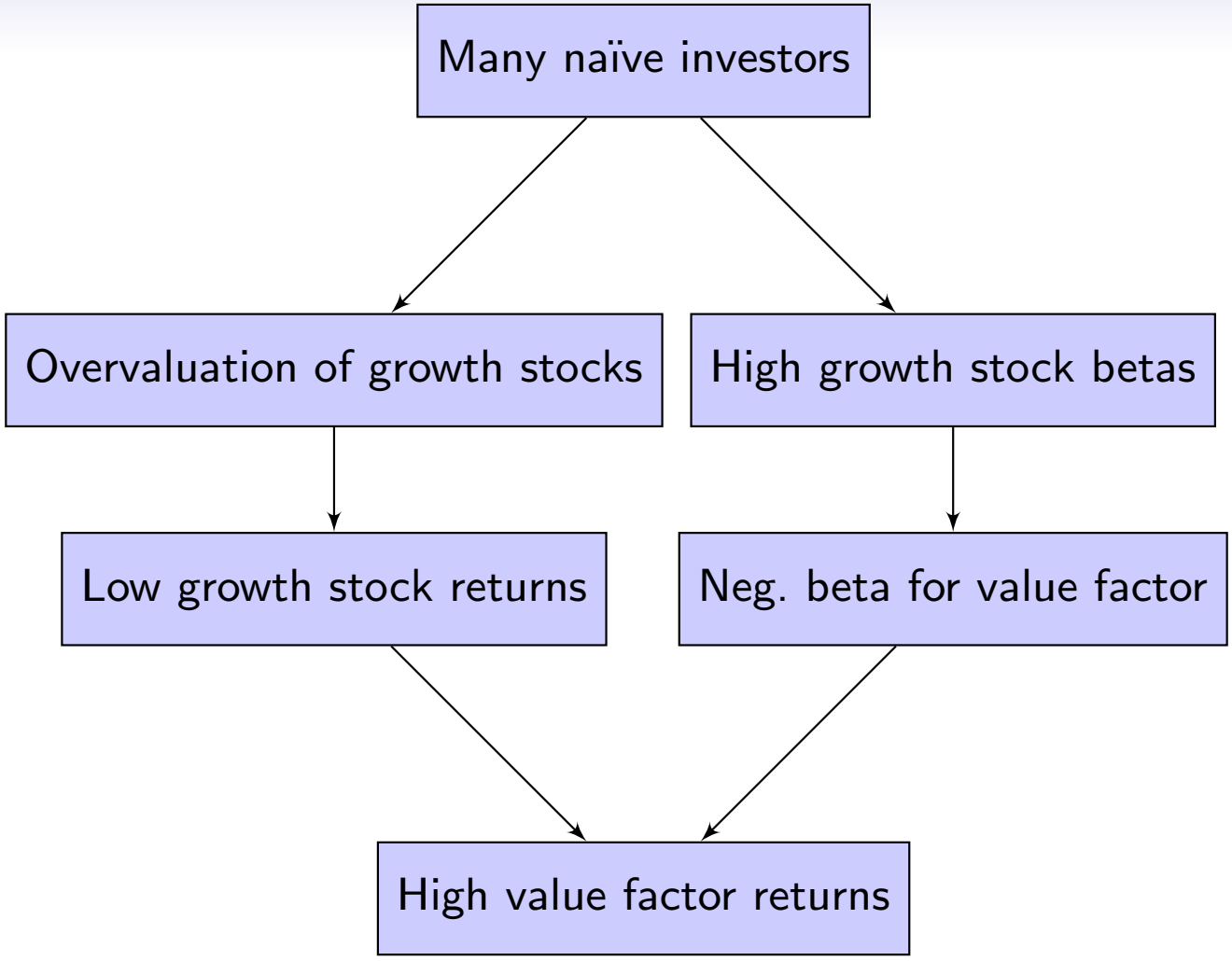
# BW Investor Sentiment and Average Factor Beta




- The Average Factor Beta is calculated monthly, based on daily observations over the previous 12 months, and using 7 different factors (inverted scale). The BW Investor Sentiment Index is the first principal component of: NYSE trading volume; the dividend premium; the closed-end fund discount; the number of IPOs; the first-day return on IPOs; and the equity share in new issues. It is orthogonalized with respect to macroeconomic variables.

# An informal sub-rational model

- Assume the existence of naïve investors whose trading affects prices and who have
  - a preference for growth/glamour stocks
  - correlated high-frequency market timing behavior
- As these investors vary their allocation to stocks, overall stock market prices are affected and glamour stocks more so
  - → Glamour stocks will exhibit high covariation with other glamour stocks
  - → Glamour stocks will exhibit high market betas
- If the activity level of naïve investors is time varying (at a lower frequency), then the glamour stocks will exhibit time-varying covariation and market beta.




**Key result**: *Time series regressions show that a more negative beta across factors predicts higher factor returns over the next two years*

# Predictive variables

We construct 4 other variables hypothesized to be related to mispricing, hence predicting future returns

- Factor volatility relative to market volatility
  - *More naïve investors → greater comovement of similar-characteristic stocks*
- Dispersion of across factors of beta and relative volatility
  - *Naïve investors' preferences is likely correlated with different characteristics at different times*
- The first principal component of the 4 variables

# Factor portfolio formation procedure

- Factors either downloaded from Kenneth French's website or calculated using HML procedure
- Factors formed 30 June based on prior year's accounting data, 70/30 splits based on NYSE cut-off points, value-weighted in small and big portfolios, etc
- Returns for July 1967 – December 2010

# The characteristics

Analyze seven value factors:

- *Book-to-Market* (HML from KF)
- *Long-Term Reversal* (De Bondt Thaler, 1985; from KF)
- *Cash Earnings Yield*
- *Net Stock Issuance* (Fama French 2008)
- *Net Operating Assets* (Hirshleifer Hou Teoh Zhang 2004)
- *Assets Growth* (Cooper Gulen Schill 2008)
- *Investment-to-Assets* (Chen Novy-Marx Zhang 2011)

And a *Composite Factor*

- Simple average of the seven factor returns

# Factor Summary Statistics (Monthly)

| | Mean | $t$(Mean) | Std.Dev. | *Sharpe* |
|---|---|---|---|---|
| Market Premium (Rm-Rf) | 0.429 | (2.10) | 4.66 | 0.319 |
| Book-to-Market (HML) | 0.405 | (3.05) | 3.03 | 0.463 |
| Long-Term Reversal | 0.332 | (2.90) | 2.61 | 0.440 |
| Cash Earnings Yield | 0.436 | (3.04) | 3.27 | 0.462 |
| Net Stock Issuance | 0.430 | (4.38) | 2.24 | 0.665 |
| Net Operating Assets | 0.325 | (5.19) | 1.43 | 0.787 |
| Assets Growth | 0.380 | (4.27) | 2.03 | 0.648 |
| Investment-to-Assets | 0.276 | (2.78) | 2.26 | 0.422 |
| Composite Factor | 0.369 | (4.69) | 1.79 | 0.712 |

Table 1

# Factor returns are positively correlated

Monthly factor return cross-correlations

| | HML | LTRev | CEY | NSI | NOA | AGr |
|---|---|---|---|---|---|---|
| Book-to-Market (HML) | 1.000 | | | | | |
| Long-Term Reversal | 0.421 | 1.000 | | | | |
| Cash Earnings Yield | 0.898 | 0.285 | 1.000 | | | |
| Net Stock Issuance | 0.620 | 0.160 | 0.631 | 1.000 | | |
| Net Operating Assets | 0.026 | 0.184 | −0.073 | 0.116 | 1.000 | |
| Assets Growth | 0.718 | 0.500 | 0.597 | 0.617 | 0.261 | 1.000 |
| Investment-to-Assets | 0.678 | 0.345 | 0.629 | 0.636 | 0.429 | 0.696 |

Table 2

# Predictor Variables: Construction and summary statistics

- Beta and volatility for each portfolio are computed monthly based on daily data.
- Predictor variables are computed by averaging and standard deviationing across factor portfolios.

| | Mean | Std.Dev. | Autocorr |
|---|---|---|---|
| Average Factor Beta | -0.126 | 0.153 | 0.778 |
| Average Factor Relative Vol | 0.427 | 0.144 | 0.603 |
| Stdev (Factor Betas) | 0.170 | 0.070 | 0.451 |
| Stdev (Fact Relative Vols) | 0.116 | 0.056 | 0.517 |
| First Principal Component | 0.000 | 1.000 | 0.587 |

Table 5A

# Time Series Regressions Predicting Next Month's Factor Returns: Beta

$$R_t = c + d \cdot \text{Predictor}_{t-1} + e \cdot \text{RmRf}_t + f \cdot \text{SMB}_t + g \cdot \text{MOM}_t + u_t$$

Predictor: Average Factor Beta

| | $d$ | t($d$) | $R^2$ |
|---|---|---|---|
| Book-to-Market (HML) | −1.815 | (−1.71)* | 0.178 |
| Long-Term Reversal | −2.019 | (−2.20)** | 0.107 |
| Cash Earnings Yield | −2.054 | (−1.92)* | 0.263 |
| Net Stock Issuance | −1.661 | (−2.49)** | 0.338 |
| Net Operating Assets | −1.680 | (−3.68)*** | 0.063 |
| Assets Growth | −1.829 | (−2.75)*** | 0.200 |
| Investment-to-Assets | −3.046 | (−3.81)*** | 0.170 |
| Composite Factor | −2.015 | (−3.08)*** | 0.219 |

Table 6

# Time Series Regressions Predicting Next Month's Factor Returns: FPC

$$R_t = c + d \cdot \text{Predictor}_{t-1} + e \cdot \text{RmRf}_t + f \cdot \text{SMB}_t + g \cdot \text{MOM}_t + u_t$$

Predictor: First Principal Component

| | $d$ | t($d$) | $R^2$ |
|---|---|---|---|
| Book-to-Market (HML) | 0.434 | (3.25)*** | 0.191 |
| Long-Term Reversal | 0.317 | (2.79)*** | 0.108 |
| Cash Earnings Yield | 0.430 | (2.97)*** | 0.272 |
| Net Stock Issuance | 0.301 | (3.22)*** | 0.344 |
| Net Operating Assets | 0.224 | (3.84)*** | 0.056 |
| Assets Growth | 0.251 | (2.93)*** | 0.197 |
| Investment-to-Assets | 0.430 | (4.61)*** | 0.165 |
| Composite Factor | 0.341 | (4.39)*** | 0.226 |

Table 6

# Longer-Horizon Return Predictability

Regression Predicting the Composite Factor Return $l$ months ahead:

$$R_t = c + d \cdot \text{Predictor}_{t-l} + e \cdot \text{RmRf}_t + f \cdot \text{SMB}_t + g \cdot \text{MOM}_t + u_t$$

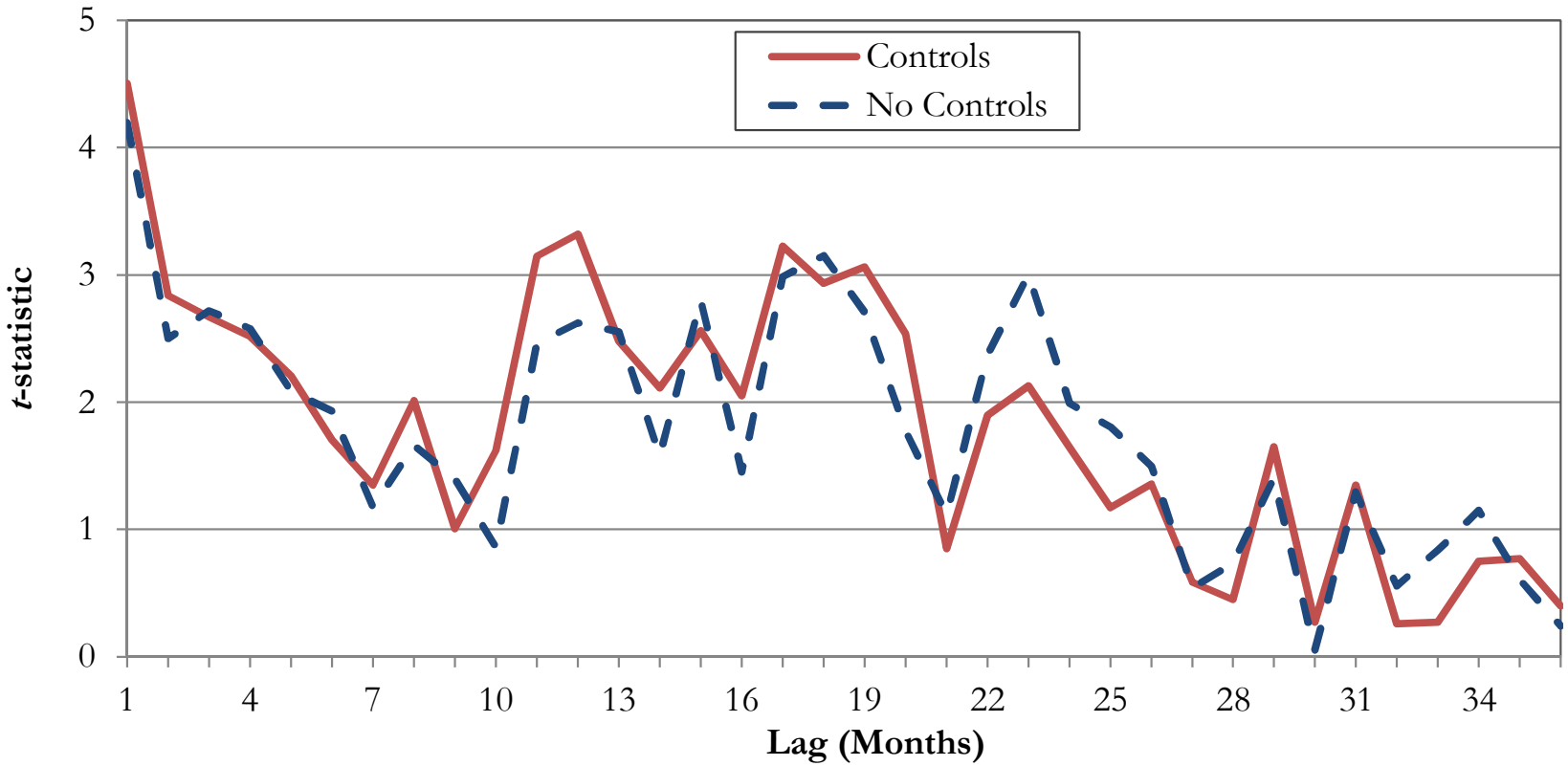



Figure 2

# Out-of-sample predictability

Rolling regressions for $\tau \leq t$ : $R_\tau = c_t + d_t \cdot \text{FactorCovar}_{\tau-1} + u_\tau$
Prediction each time period $t$: $\hat{R}_{2t,t+1} = c_t + d_t \cdot \text{FactorCovar}_t$

| Estimation Period (Years): | 5 | 10 | 20 | 30 |
|---|---|---|---|---|
| Panel A: Out-of-Sample MSPE-Adjusted $t$-statistics | | | | |
| Average Factor Beta | 2.09** | 2.56*** | 2.60*** | 2.50*** |
| Avg Factor Relative Volatility | 3.37*** | 4.27*** | 4.06*** | 3.53*** |
| StDev (Factor Betas) | 1.59* | 1.69** | 1.78** | 1.12 |
| StDev (Factor Relative Vols) | 2.55*** | 3.24*** | 2.83*** | 1.98** |
| First Principal Component | 3.14*** | 3.85*** | 3.56*** | 2.81*** |
| Panel B: Out-of-Sample $R^2$-statistics | | | | |
| Average Factor Beta | 1.21% | 2.34% | 3.06% | 3.70% |
| Avg Factor Relative Volatility | 2.95% | 4.49% | 5.31% | 5.74% |
| StDev (Factor Betas) | 0.60% | 0.76% | 1.09% | 0.42% |
| StDev (Factor Relative Vols) | 1.61% | 3.60% | 3.85% | 2.93% |
| First Principal Component | 3.33% | 5.13% | 5.91% | 5.82% |

Table 9

# Alternative sentiment measures

- Baker-Wurgler (2006): first principal component of: the closed-end fund discount; the number of IPOs; the equity share in new issues; NYSE trading volume (L12); the dividend premium (L12); and the first-day return on IPOs (L12).
- Index of Consumer Sentiment from the University of Michigan
- American Association of Individual Investors Bull-Bear Spread (since 1987).

Stambaugh, Yu and Yuan (2012) find that the BW index and the Consumer Sentiment index predict the premia related to net stock issuance, net operating assets, asset growth and investment-to-assets.

# Investor sentiment and factor returns

$$R_t = c + d{\cdot}\text{Sentiment}_{t-1} + e{\cdot}\text{FPC}_{t-1} + f{\cdot}\text{RmRf}_t + g{\cdot}\text{SMB}_t + h{\cdot}\text{MOM}_t + u_t$$

| | BWSent | | BWSent$^{\perp}$ | | MichSent | | AAIISent | |
|---|---|---|---|---|---|---|---|---|
| **Panel A: Without Controls** | | | | | | | | |
| Sent, $d$ | 0.173 | 0.069 | 0.200 | 0.100 | 0.558 | 0.030 | 2.370 | 1.742 |
| $t(d)$ | (1.92)* | (0.80) | (2.18)** | (1.16) | (0.72) | (0.04) | (3.14)*** | (2.39)** |
| FPC, $e$ | | 0.358 | | 0.350 | | 0.376 | | 0.413 |
| $t(e)$ | | (4.02)*** | | (3.97)*** | | (4.25)*** | | (3.58)*** |
| Rsq | 0.009 | 0.046 | 0.012 | 0.047 | 0.002 | 0.044 | 0.038 | 0.090 |
| Nobs | 521 | 521 | 521 | 521 | 521 | 521 | 281 | 281 |
| **Panel B: With Controls** | | | | | | | | |
| Sent, $d$ | 0.118 | 0.021 | 0.141 | 0.048 | 0.456 | −0.036 | 2.500 | 1.919 |
| $t(d)$ | (1.39) | (0.25) | (1.66)* | (0.59) | (0.68) | (−0.06) | (4.01)*** | (3.13)*** |
| FPC, $e$ | | 0.335 | | 0.328 | | 0.342 | | 0.392 |
| $t(e)$ | | (4.43)*** | | (4.37)*** | | (4.51)*** | | (4.07)*** |
| Rsq | 0.195 | 0.227 | 0.196 | 0.227 | 0.191 | 0.226 | 0.240 | 0.287 |
| Nobs | 521 | 521 | 521 | 521 | 521 | 521 | 281 | 281 |

Table 10

# Cross-sectional evidence

- Do the sensitivities to the Predictors explain the cross-section of average stock returns?
- Standard Fama-MacBeth method
- Test assets: 25 FF (5BTM x 5Size) + 30 Industry Portfolios
  - Most models get an $R^2$ close to zero (Lewellen Nagel Shanken 2010)
  - Lewellen et al. find that the FF 3-Factor model gets an $R^2$ of 31%

# Cross-sectional evidence

First Stage: Time-Series Regressions for each portfolio $i$:

$$R_{i,t} - Rf_t = c_i + \beta_{PREDi} \cdot \text{Predictor}_{t-1} + \beta_{HMLi} \cdot \text{HML}_t + \beta_{RmRfi} \cdot \text{RmRf}_t + \beta_{SMBi} \cdot \text{SMB}_t + u_{i,t}$$

Second Stage: Cross-Sectional Regressions for each month $t$:

$$R_{i,t} - Rf_t = \lambda_{0t} + \lambda_{PREDt} \cdot \beta_{PREDi} + \lambda_{HMLt} \cdot \beta_{HMLi} + \lambda_{RmRft} \cdot \beta_{RmRfi} + \lambda_{SMBt} \cdot \beta_{SMBi} + v_{i,t}$$

Third Stage: Compare Actual Average to Predicted Return for each Portfolio $i$:

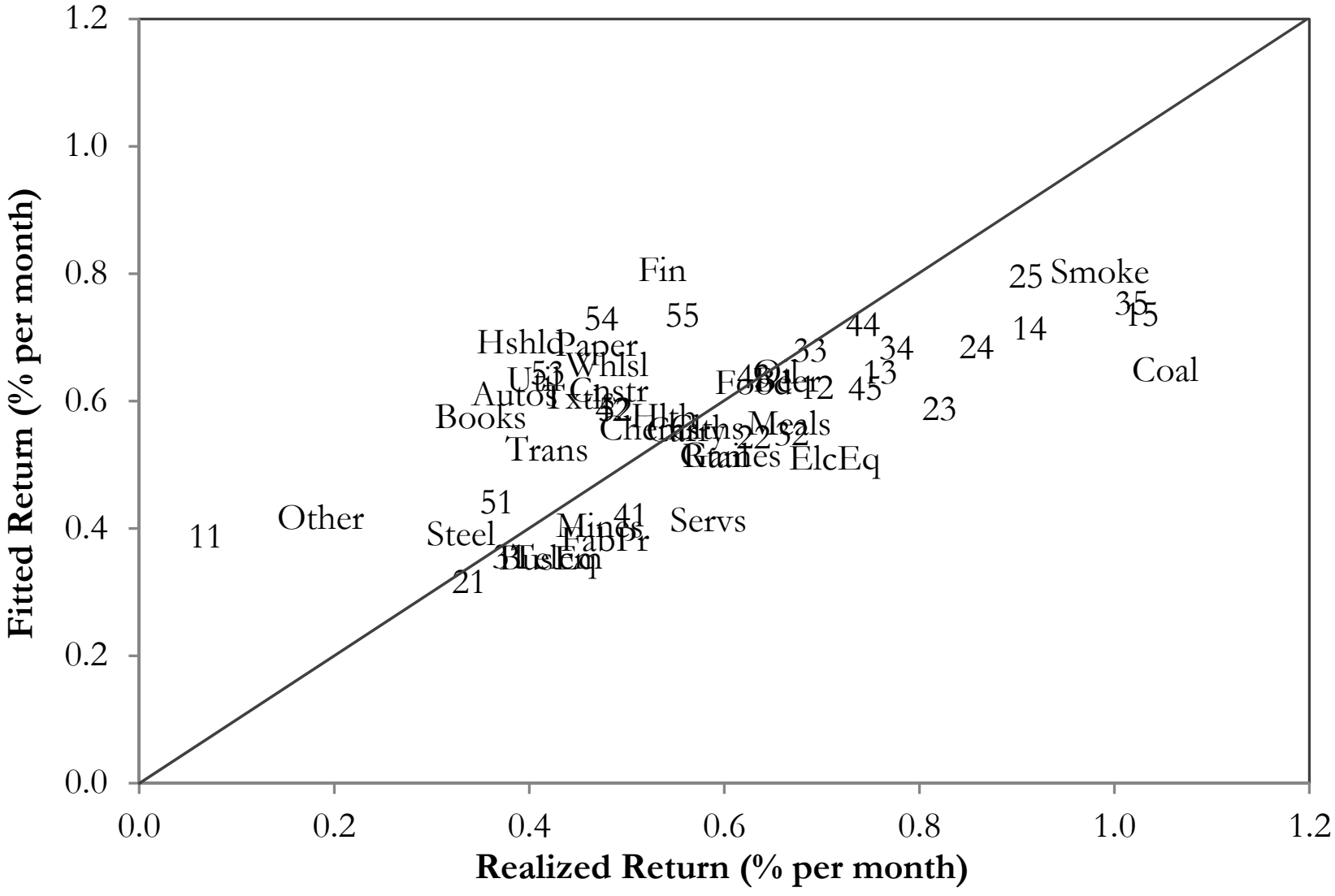
$$\overline{R_i - Rf} = \overline{\lambda_{0t}} + \overline{\lambda_{PREDt}} \cdot \beta_{PREDi} + \overline{\lambda_{HMLt}} \cdot \beta_{HMLi} + \overline{\lambda_{RmRft}} \cdot \beta_{RmRfi} + \overline{\lambda_{SMBt}} \cdot \beta_{SMBi} + w_i$$

# Fama-MacBeth Regressions

| FF25 + 30 Industry Portfolios as Test Assets | | | | | |
|---|---|---|---|---|---|
| Predictor | $\overline{\lambda_{PREDt}}$ | $\overline{\lambda_{HMLt}}$ | $\overline{\lambda_{RMRFt}}$ | $\overline{\lambda_{SMBt}}$ | $R^2$ |
| (None) | | 0.264 | −0.423 | 0.125 | 0.278 |
| | | (1.60) | (−1.36) | (0.85) | |
| First Principal | 0.643 | | | | 0.360 |
| Component | (2.38)** | | | | |
| | 0.662 | | −0.272 | 0.123 | 0.439 |
| | (2.65)*** | | (−0.95) | (0.84) | |
| | 0.660 | 0.320 | −0.272 | 0.123 | 0.439 |
| | (2.93)*** | (1.89)* | (−0.92) | (0.84) | |

Table 13C

# Realized vs. fitted returns: 1-factor FPC model



# Conclusion

- We find:
  - Value-growth factor portfolios exhibit negative market betas across seven different definitions of value-growth
  - The more negative the market betas, the higher the subsequent factor returns
  - Similarly for factor relative volatility and the dispersion in factor covariances
- This is consistent with a time-varying activity level among naïve investors who effectively attempt market timing
  - Their trading generates negative market betas, high factor volatility, high covariance dispersion, and positive expected returns on the factors
  - The constructs are correlated with the Baker-Wurgler Investor Sentiment Index, but are more successful in predicting stock returns

# Predictor Variables: Correlations

| | Avg(Beta) | Avg(RVol) | Std(Beta) | Std(RVol) |
|---|---|---|---|---|
| Average Factor Beta | 1.000 | | | |
| Average Factor Relative Vol | -0.445 | 1.000 | | |
| Stdev (Factor Betas) | -0.077 | 0.471 | 1.000 | |
| Stdev (Fact Relative Vols) | -0.248 | 0.694 | 0.599 | 1.000 |
| First Principal Component | -0.499 | 0.881 | 0.733 | 0.879 |

Table 5B

# Factor Market Betas are negative

| | Daily Observations | | Monthly Observations | |
|---|---|---|---|---|
| | Beta | (t-stat) | Beta | (t-stat) |
| Book-to-Market (HML) | −0.155 | (−12.28) | −0.207 | (−5.29) |
| Long-Term Reversal | −0.067 | (−5.79) | −0.035 | (−0.96) |
| Cash Earnings Yield | −0.126 | (−9.04) | −0.189 | (−4.69) |
| Net Stock Issuance | −0.192 | (−28.23) | −0.243 | (−11.30) |
| Net Operating Assets | 0.021 | (4.37) | −0.041 | (−2.71) |
| Assets Growth | −0.147 | (−19.91) | −0.180 | (−8.54) |
| Investment-to-Assets | −0.108 | (−11.18) | −0.146 | (−6.02) |
| Composite Factor | −0.110 | (−15.45) | −0.145 | (−6.84) |

Table 3

# Time Series Regressions Predicting Next Month's Factor Returns (II)

$$R_t = c + d \cdot \text{Predictor}_{t-1} + e \cdot \text{RmRf}_t + f \cdot \text{SMB}_t + g \cdot \text{MOM}_t + u_t$$

Predictor: Average Factor Relative Volatility

| | $d$ | t($d$) | $R^2$ |
|---|---|---|---|
| Book-to-Market (HML) | 2.714 | (3.11)*** | 0.187 |
| Long-Term Reversal | 2.113 | (2.86)*** | 0.107 |
| Cash Earnings Yield | 2.864 | (3.13)*** | 0.270 |
| Net Stock Issuance | 1.766 | (3.16)*** | 0.339 |
| Net Operating Assets | 1.360 | (3.55)*** | 0.050 |
| Assets Growth | 1.559 | (2.65)*** | 0.194 |
| Investment-to-Assets | 2.820 | (4.46)*** | 0.161 |
| Composite Factor | 2.171 | (4.26)*** | 0.221 |

Table 6

# Time Series Regressions Predicting Next Month's Factor Returns (III)

$$R_t = c + d \cdot \text{Predictor}_{t-1} + e \cdot \text{RmRf}_t + f \cdot \text{SMB}_t + g \cdot \text{MOM}_t + u_t$$

Predictor: StDev (Factor Betas)

| | $d$ | t($d$) | $R^2$ |
|---|---|---|---|
| Book-to-Market (HML) | 3.667 | (2.01)** | 0.177 |
| Long-Term Reversal | 1.714 | (1.07) | 0.096 |
| Cash Earnings Yield | 3.388 | (1.83)* | 0.260 |
| Net Stock Issuance | 2.450 | (1.99)** | 0.332 |
| Net Operating Assets | 1.313 | (1.55) | 0.035 |
| Assets Growth | 1.324 | (1.14) | 0.184 |
| Investment-to-Assets | 2.508 | (2.02)** | 0.135 |
| Composite Factor | 2.338 | (2.30)** | 0.199 |

Table 6

# Time Series Regressions Predicting Next Month's Factor Returns (IV)

$$R_t = c + d \cdot \text{Predictor}_{t-1} + e \cdot \text{RmRf}_t + f \cdot \text{SMB}_t + g \cdot \text{MOM}_t + u_t$$

Predictor: StDev (Factor Relative Vols)

| | $d$ | t($d$) | $R^2$ |
|---|---|---|---|
| Book-to-Market (HML) | 7.130 | (3.00)*** | 0.187 |
| Long-Term Reversal | 4.794 | (2.31)** | 0.104 |
| Cash Earnings Yield | 6.473 | (2.58)*** | 0.267 |
| Net Stock Issuance | 4.714 | (2.61)*** | 0.340 |
| Net Operating Assets | 3.239 | (2.73)*** | 0.047 |
| Assets Growth | 3.790 | (2.58)** | 0.192 |
| Investment-to-Assets | 5.997 | (3.48)*** | 0.151 |
| Composite Factor | 5.162 | (3.70)*** | 0.216 |

Table 6

# Longer-Horizon Return Predictability

Regression Predicting the Composite Factor Return, $R_t$:

$$R_t = c + d \cdot [L_a – L_b]\text{Predictor} + e \cdot \text{RmRf}_t + f \cdot \text{SMB}_t + g \cdot \text{MOM}_t + u_t$$

| | Predictor Calculated Over Month Lags: | | | | |
|---|---|---|---|---|---|
| Predictor | 1 | 2–7 | 1–12 | 13–24 | 25–36 |
| Average Factor Beta | −2.015 | −1.653 | −1.624 | −1.556 | −0.996 |
| | (−3.08)*** | (−2.40)** | (−2.23)** | (−2.38)** | (−1.70)* |
| Avg Factor Relative Volatility | 2.171 | 1.766 | 2.366 | 2.142 | 0.097 |
| | (4.26)*** | (2.38)** | (2.82)*** | (2.86)*** | (0.16) |
| StDev (Factor Betas) | 2.338 | 4.557 | 5.713 | 4.930 | −0.230 |
| | (2.30)** | (2.96)*** | (2.84)*** | (2.38)** | (−0.14) |
| StDev (Factor Relative Vols) | 5.162 | 6.585 | 9.594 | 6.182 | 0.214 |
| | (3.70)*** | (3.41)*** | (4.13)*** | (2.77)*** | (0.12) |
| First Principal Component | 0.341 | 0.298 | 0.346 | 0.264 | 0.029 |
| | (4.39)*** | (3.30)*** | (3.56)*** | (3.00)*** | (0.44) |

Table 7

# Predictability of own factor covariances

The factors' own covariances have weaker predictive power...

$$R_{i,t} = c + d \cdot \text{Predictor}_{i,t-1} + e \cdot \text{RmRf}_t + f \cdot \text{SMB}_t + g \cdot \text{MOM}_t + u_t$$

Predictor: Beta of the LHS factor

| | $d$ | t($d$) | $R^2$ |
|---|---|---|---|
| Book-to-Market (HML) | −1.147 | (−1.72)* | 0.179 |
| Long-Term Reversal | −0.659 | (−1.27) | 0.098 |
| Cash Earnings Yield | −1.320 | (−2.07)** | 0.265 |
| Net Stock Issuance | −0.641 | (−1.22) | 0.329 |
| Net Operating Assets | −0.216 | (−0.38) | 0.032 |
| Assets Growth | −1.439 | (−2.64)*** | 0.199 |
| Investment-to-Assets | −2.292 | (−3.19)*** | 0.163 |
| Pooled | −0.984 | (−2.29)** | 0.108 |

Table 8

# Predictability of other factor covariances

. . . as much of the predictive power comes from the covariances of the other factors.

$$R_{i,t} = c + d \cdot \text{Predictor}_{-i,t-1} + e \cdot \text{RmRf}_t + f \cdot \text{SMB}_t + g \cdot \text{MOM}_t + u_t$$

Predictor: Avg. beta of 6 other factors

| | $d$ | t($d$) | $R^2$ |
|---|---|---|---|
| Book-to-Market (HML) | −2.010 | (−1.78)* | 0.174 |
| Long-Term Reversal | −2.512 | (−2.63)*** | 0.107 |
| Cash Earnings Yield | −1.942 | (−1.82)* | 0.263 |
| Net Stock Issuance | −1.570 | (−2.59)*** | 0.339 |
| Net Operating Assets | −1.515 | (−3.82)*** | 0.064 |
| Assets Growth | −1.764 | (−2.69)*** | 0.198 |
| Investment-to-Assets | −2.998 | (−3.88)*** | 0.167 |
| Pooled | −2.008 | (−3.31)*** | 0.115 |

Table 8

# Predictability of own and other factor covariances

And controlling for other factors' covariances, own covariances do not predict returns.

$$R_{i,t} = c + d \cdot \text{Predictor}_{i,t-1} + e \cdot \text{Predictor}_{-i,t-1} + u_t$$

Predictors: Own beta and avg. beta of 6 other factors

| | $d$ | t($d$) | $e$ | t($e$) | $R^2$ |
|---|---|---|---|---|---|
| Book-to-Market (HML) | −0.758 | (−0.95) | −0.789 | (−0.56) | 0.009 |
| Long-Term Reversal | 0.115 | (0.19) | −2.370 | (−2.12)** | 0.016 |
| Cash Earnings Yield | −0.920 | (−1.11) | −0.265 | (−0.23) | 0.006 |
| Net Stock Issuance | −0.198 | (−0.30) | −1.680 | (−2.33)** | 0.017 |
| Net Operating Assets | 0.273 | (0.49) | −1.692 | (−4.23)*** | 0.040 |
| Assets Growth | −0.753 | (−0.95) | −1.096 | (−1.22) | 0.021 |
| Investment-to-Assets | −0.662 | (−0.70) | −2.404 | (−2.43)** | 0.042 |
| Pooled | −0.383 | (−0.99) | −1.614 | (−3.18)*** | 0.015 |

Table 8

# Predicting Decile Portfolio Returns

$$R_t - Rf_t = c + d \cdot \text{Predictor}_{t-1} + e \cdot \text{RmRf}_t + f \cdot \text{SMB}_t + g \cdot \text{MOM}_t + u_t$$

| | Decile | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 9 | 10 | 10–1 |
| Portfolio Return Predicted by BW Investor Sentiment Level | | | | | |
| Book-to-Market | −0.049 | 0.097 | −0.019 | 0.060 | 0.109 |
| Long-Term Reversal | −0.057 | −0.049 | 0.096 | −0.024 | 0.033 |
| Cash Earnings Yield | −0.060 | −0.026 | 0.072 | −0.059 | 0.001 |
| Net Stock Issuance | −0.224*** | −0.056 | 0.131 | −0.115 | 0.110 |
| Net Operating Assets | −0.270*** | 0.131* | 0.074 | 0.048 | 0.318*** |
| Assets Growth | −0.300*** | −0.071 | −0.090 | −0.106 | 0.194 |
| Investment-to-Assets | −0.189** | −0.109 | 0.104 | −0.094 | 0.095 |
| Composite Factor | −0.164** | −0.012 | 0.053 | −0.041 | 0.123 |

Table 12C

# Predicting Decile Portfolio Returns

$$R_t - Rf_t = c + d \cdot \text{Predictor}_{t-1} + e \cdot \text{RmRf}_t + f \cdot \text{SMB}_t + g \cdot \text{MOM}_t + u_t$$

| | Decile | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 9 | 10 | 10–1 |
| Portfolio Return Predicted by First Principal Component | | | | | |
| Book-to-Market | −0.226*** | 0.003 | 0.312** | 0.298** | 0.524*** |
| Long-Term Reversal | −0.282*** | 0.012 | 0.327*** | 0.346** | 0.628*** |
| Cash Earnings Yield | −0.277*** | −0.049 | 0.296** | 0.306* | 0.583** |
| Net Stock Issuance | −0.312*** | −0.132* | 0.236** | 0.080 | 0.392*** |
| Net Operating Assets | −0.321*** | −0.025 | 0.191** | 0.244** | 0.565*** |
| Assets Growth | −0.377*** | −0.020 | 0.112 | 0.149 | 0.526*** |
| Investment-to-Assets | −0.326*** | −0.253*** | 0.242** | 0.079 | 0.405*** |
| Composite Factor | −0.303*** | −0.066** | 0.245*** | 0.215*** | 0.518*** |

Table 12B

# What determines the value factor betas?

**Average Factor Beta and Past Market Premium.** This table presents the Average Factor Beta according to whether the prior Short-Term (1–6 month) and Long-Term (13–36 month) equity premium was positive or negative.

| | Pos. Short-Term | | Neg. Short-Term | | Difference | |
|---|---|---|---|---|---|---|
| | Beta | $t$-stat | Beta | $t$-stat | Beta | $t$-stat |
| Pos. Long-Term | −0.073 | (−5.13) | −0.130 | (−5.39) | 0.057 | (2.45) |
| Neg. Long-Term | 0.019 | (1.27) | −0.042 | (−2.80) | 0.061 | (3.84) |
| Difference | −0.092 | (−5.26) | −0.088 | (−3.18) | −0.004 | (−0.13) |

# The dynamics of factor betas

- The factor betas exhibit considerable time variation
  - Consistent with time variation in naïve investors' activity level
- The factor betas are highly negatively correlated with the Baker-Wurgler (2006, 2007) Investor Sentiment Index
- This suggests that the negative factor betas could be an alternative proxy for investor sentiment

# The behavioral hypothesis and test

If the trading of naïve investors affects systematic risk in the manner suggested, the key prediction is that factor returns will be higher in periods following strongly negative factors betas than in periods following less negative (or positive) factor betas.

- *More active naïve investors* $\rightarrow$
  - *factor betas are more negative*
  - *factor portfolios are more mispriced* $\rightarrow$ *greater subsequent reversals*
- **Key result**: *Time series regressions show that a more negative beta across factors predicts higher factor returns over the next two years*
  - Inconsistent with the conditional CAPM.