

# Conditioning Variables and the Cross-Section of Stock Returns

Wayne E. Ferson

University of Washington and NBER

Campbell R. Harvey

Duke University and NBER

# 1. A Brief History of Asset Pricing Research

- Graham and Dodd (1934) - Asset judged by set of fundamental factors
- Sharpe (1964)-Lintner (1965) Capital Asset Pricing Model
- Anomalies (1970s-1980s) - systematic patterns in errors often related to fundamentals
- Merton (1970) ICAPM; Ross (1976) APT

# 1. A Brief History of Asset Pricing Research

- Time-series predictability (mid-80s and 90s) many authors including Ferson and Harvey (1991)
- Cross-sectional predictability (1990s) Fama and French (199x)
- Three factor model; Four factor model (mid, late 90s)
- Behavioral explanations (overconfidence) Kyle and Wang.

## 2. Economic motivation

- Explaining expected returns
  - Cost of capital, project evaluation
  - Performance evaluation, EVA
- Forecasting returns
  - Asset allocation
  - Stock selection
- Big payoff to discovering “the model”

### 3. Our perspective

- Issues with Fama-French three factor model:
  - De facto standard model
  - Holds up well to unconditional tests

But

- static model (parameters constant)
- what is the role of *time-series* predictability in the *cross-section* of expected asset returns

## 4. Method

- Test for time-varying parameters in 3 factor model
- Investigate the role of time-series predictability
- Analyze robustness across different portfolio formation rules
- Examine alternatives
- Study different econometric methods for combining time-series and cross-sectional analysis

## 4. Method

Test for time-varying parameters in 3 factor model

$$E_t[r_{i,t+1}] = \alpha_{i,t} + \beta'_{i,t} E_t[\mathbf{r}_{p,t+1}]$$

$$\alpha_{i,t} = a_{0,i} + a_{1,i} \mathbf{Z}_t$$

$$\beta_{i,t} = b_{0,i} + b'_{1,i} \mathbf{Z}_t$$

## 4. Method

Investigate the role of time-series predictability

1. Forecast each portfolio return by regression on common set of lagged instruments, call forecast “Fit.” [It is generated to be out of sample].

Instruments:  $\Delta 3\text{mo Tbill}$ , S&P D/P, Baa-Aaa, 10yr-3mo, 1 month Tbill

2. Include “Fit” in cross-sectional model as “Fourth factor”



## 4. Method

Analyze robustness across different portfolio formation rules

1. Fama-French size/book-to-market value
2. Industry
3. Size/book-to-market/momentum

## 4. Method

Examine alternatives

1. Use attributes rather than betas on attributes  
(diminishes EIV problem)
2. Four factor model Elton, Gruber and Blake

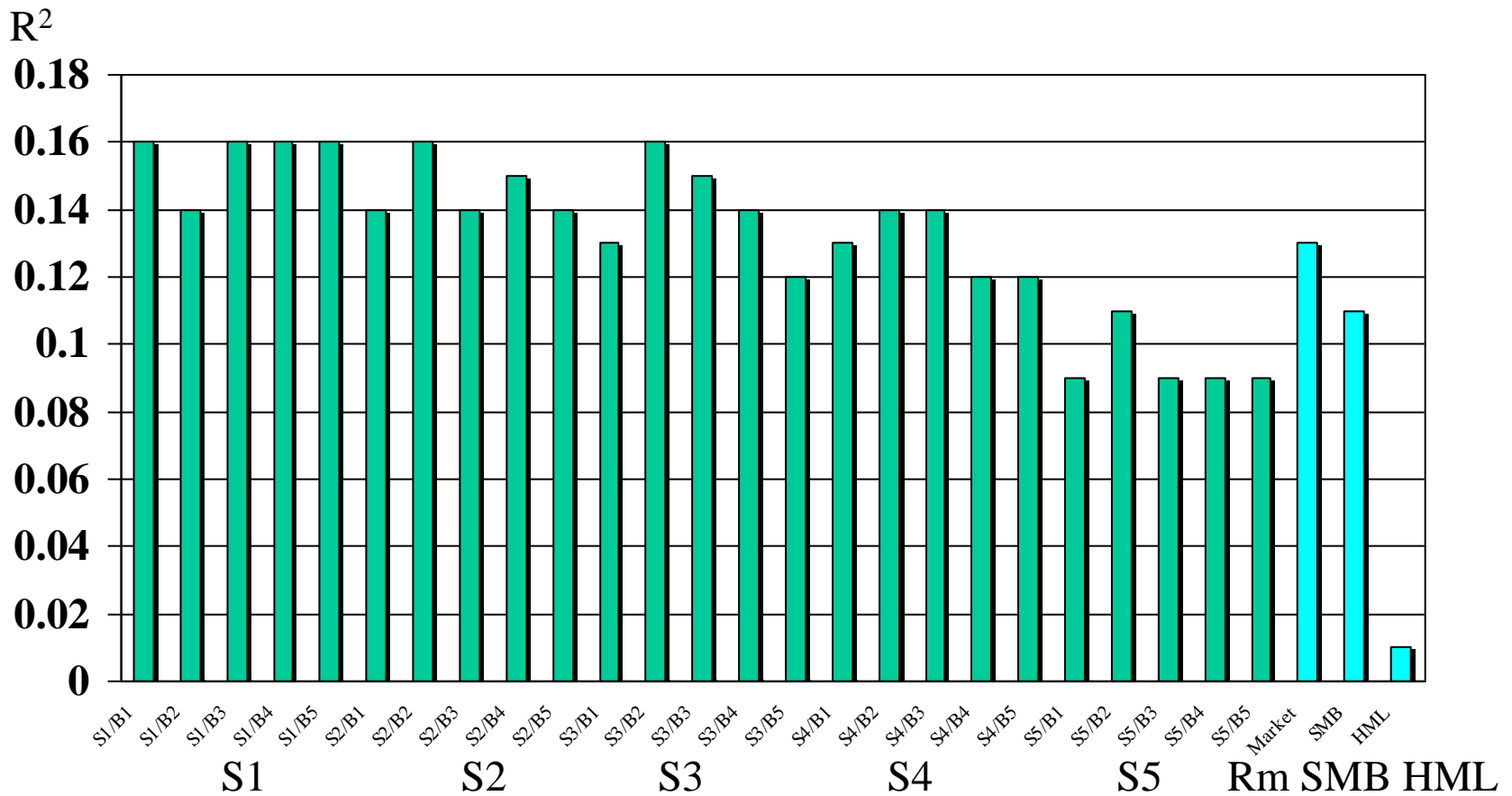
## 4. Method

Study different econometric methods for combining time-series and cross-sectional analysis

1. Time-series regressions
2. Efficient weighted Fama-MacBeth (weight monthly estimates in proportion to their variance)
3. Panel regression approach

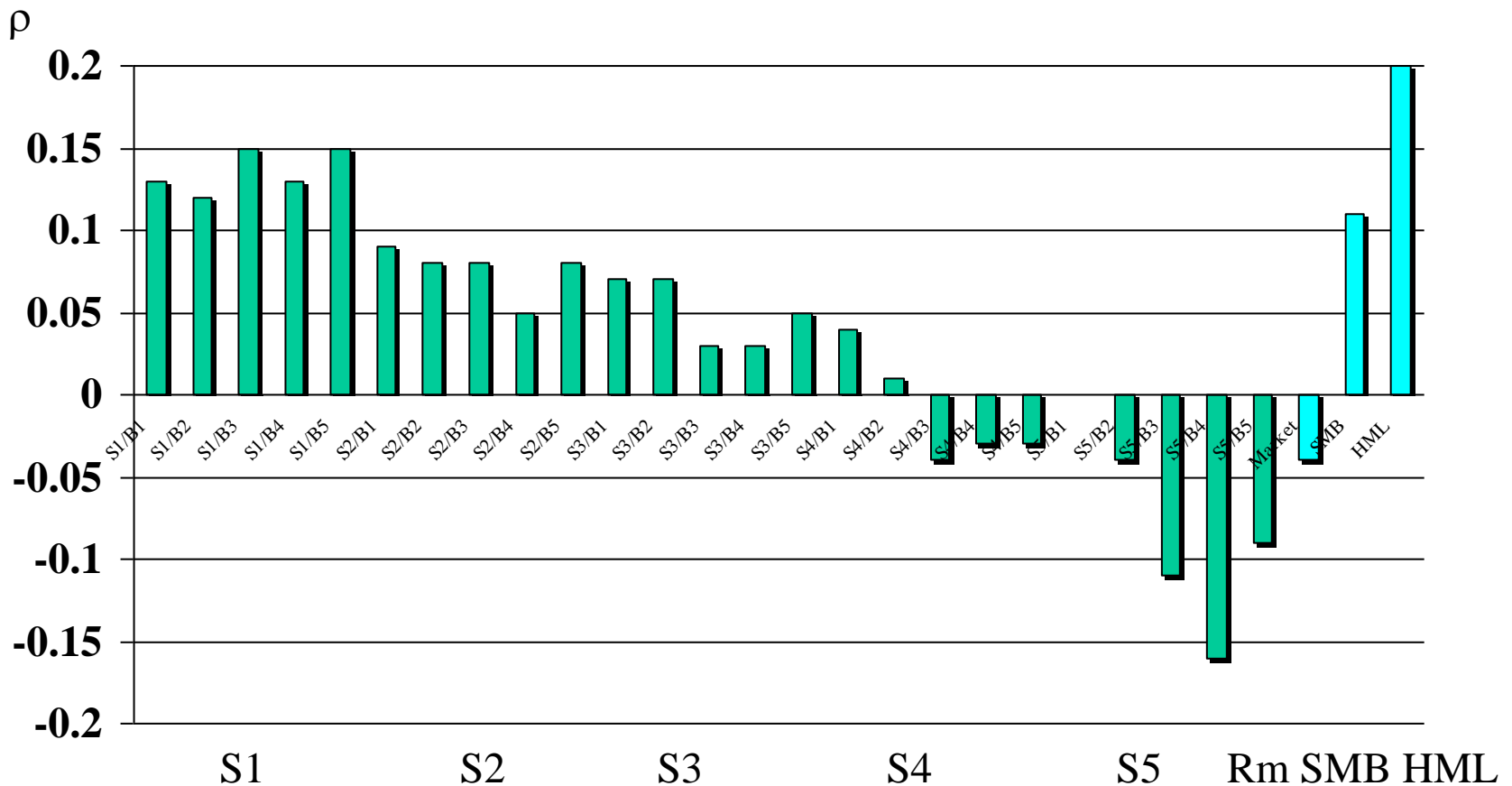
# 5. Results: Time-series predictability

## Size and Book-to-Market Value Portfolios



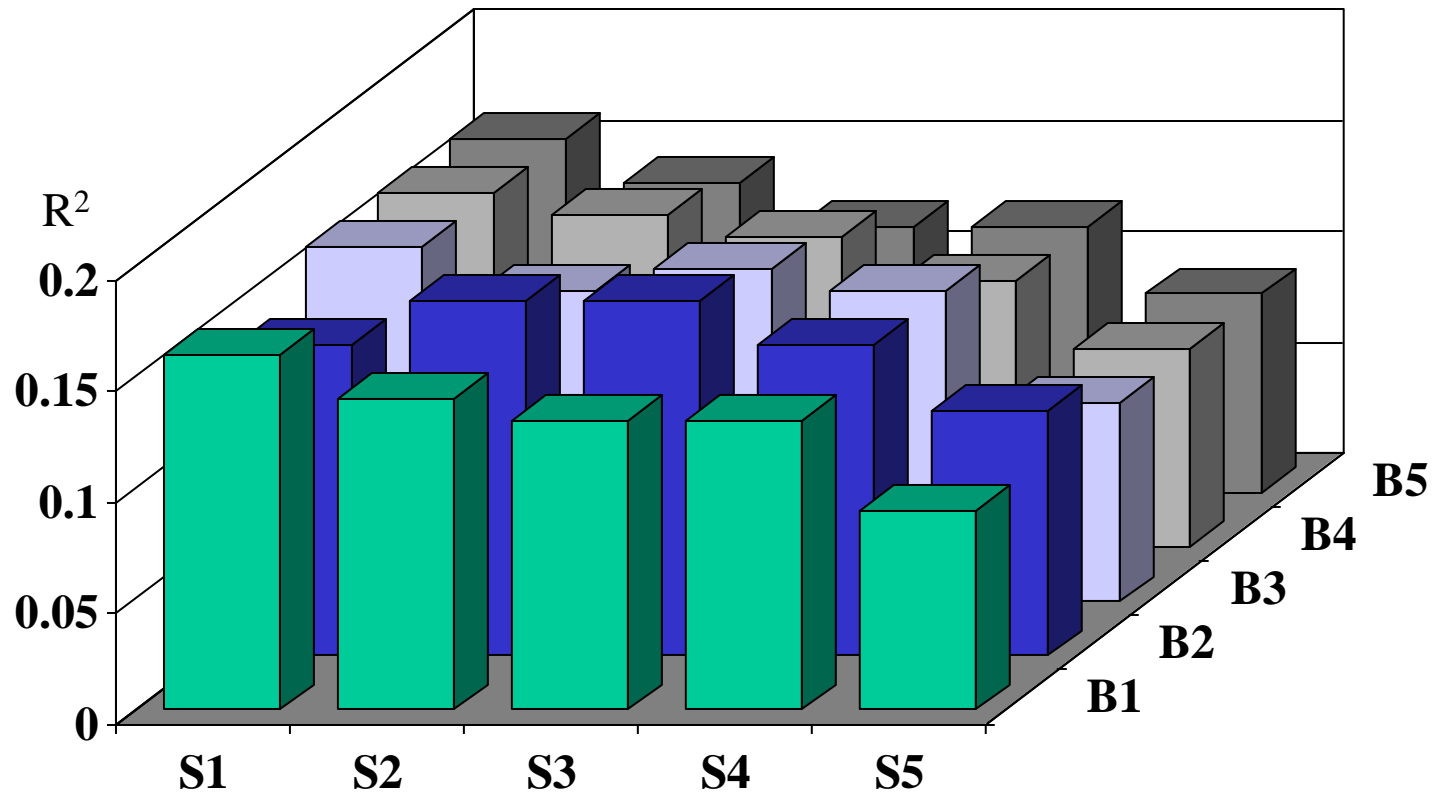
# 5. Results: Time-series autocorrelation

## Size and Book-to-Market Value Sorted Portfolios



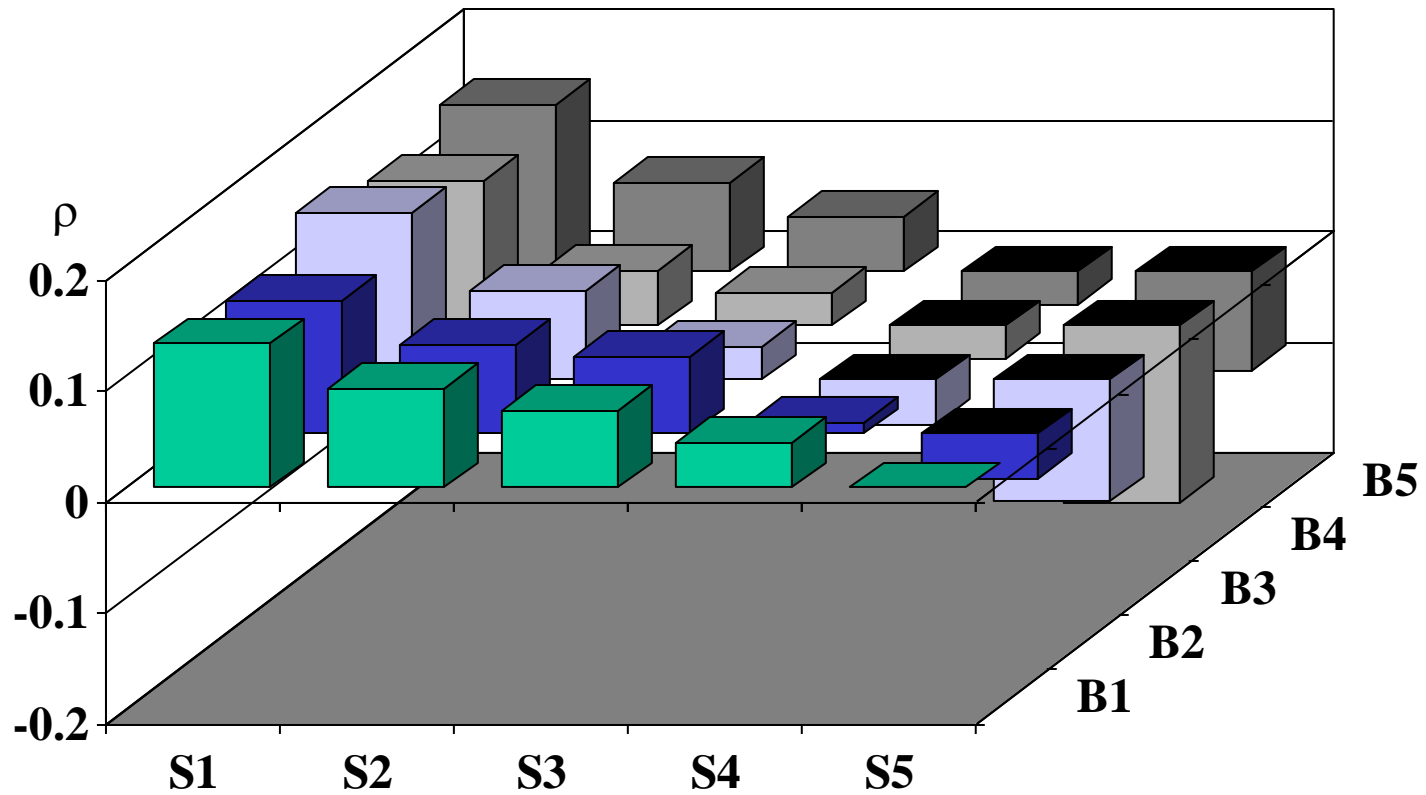
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## Size and Book-to-Market Value Portfolios



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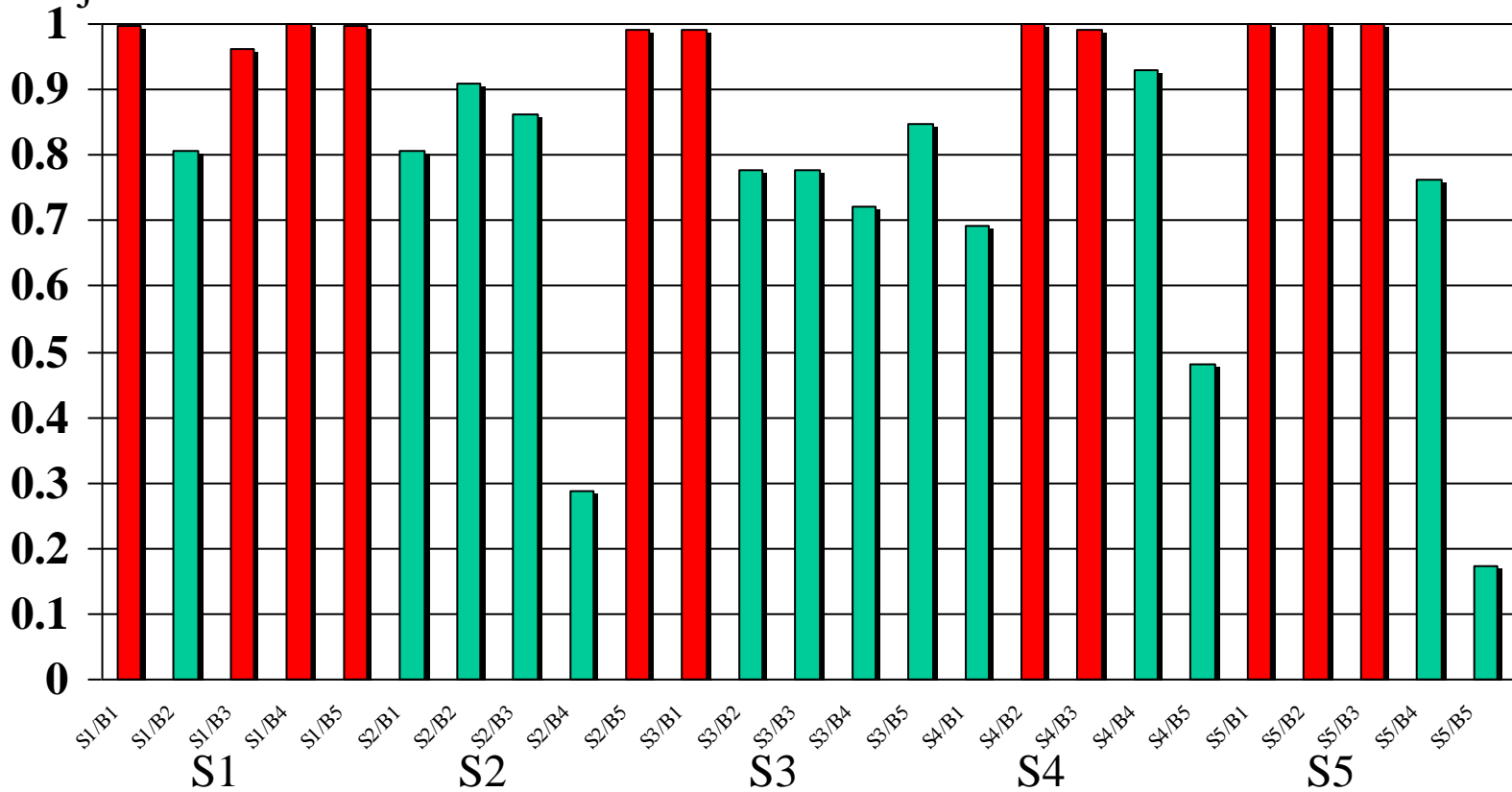
## Size and Book-to-Market Value Sorted Portfolios



# 5. Results: Is Risk Constant?

## Size and Book-to-Market Value Portfolios

Confidence  
of Rejection\*

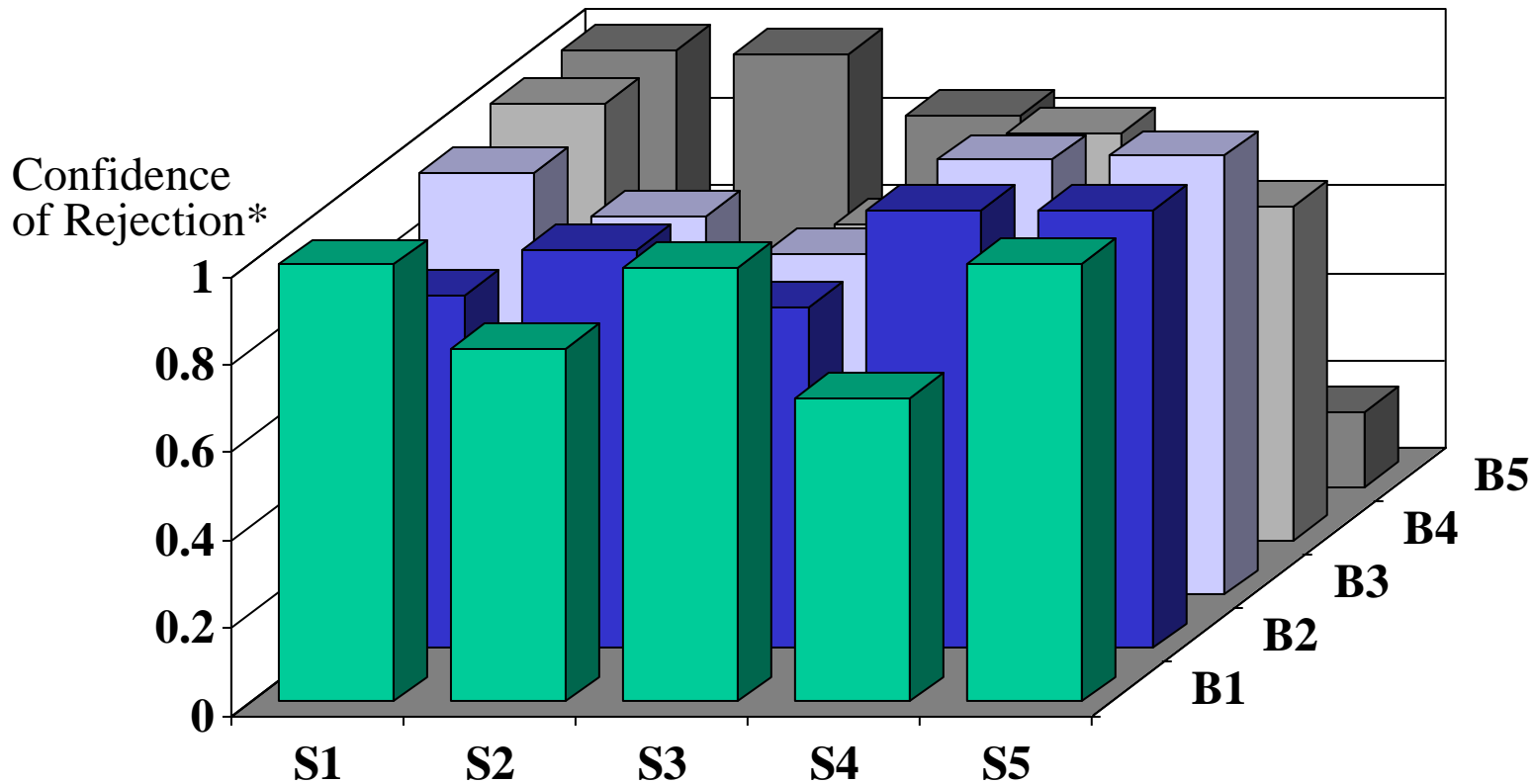


\*1-pvalue in test of null that parameters are constant.



# 5. Results: Is Risk Constant?

## Size and Book-to-Market Value Portfolios



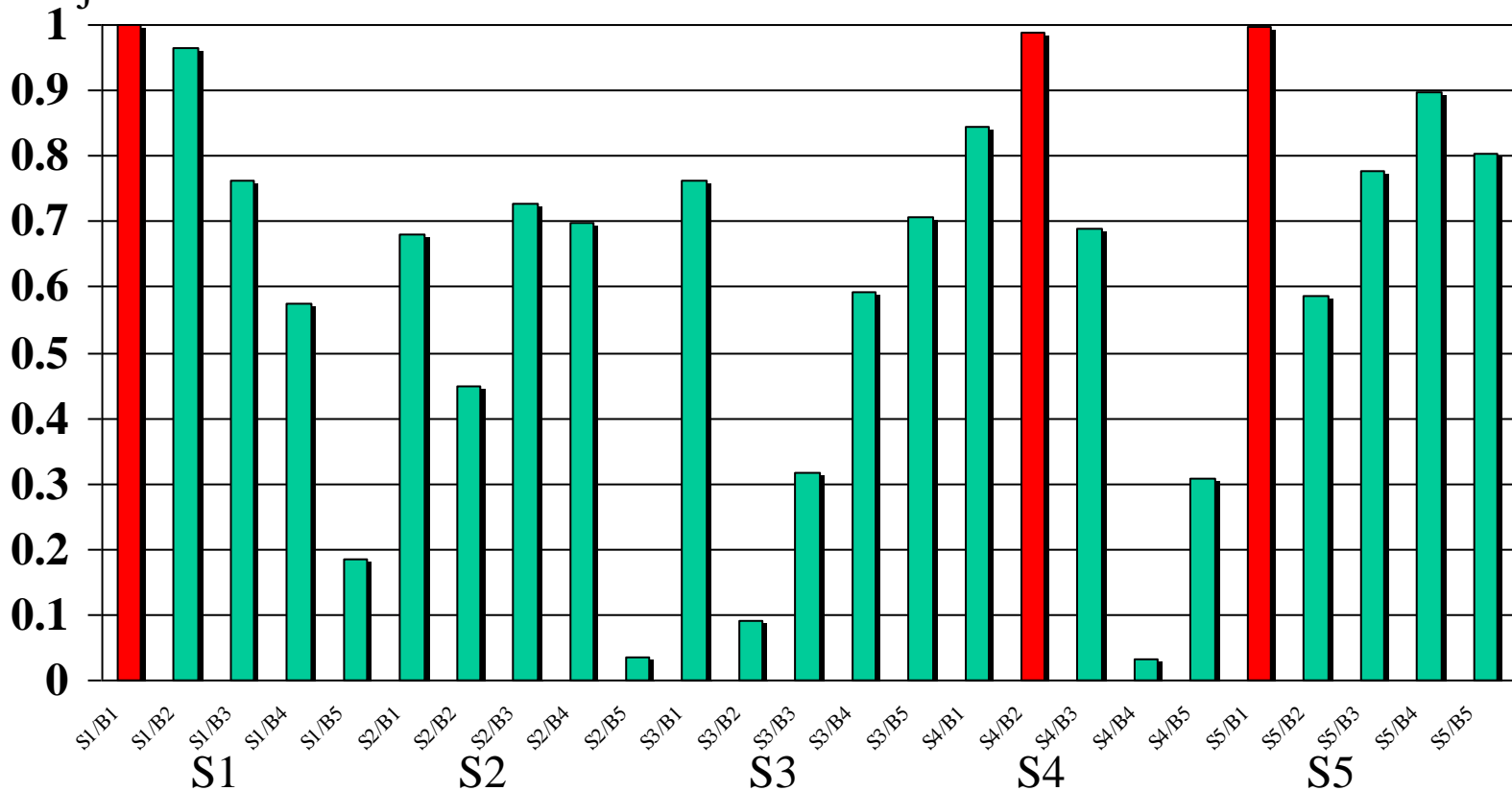
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# 5. Results: Are Intercepts Zero?

## Size and Book-to-Market Value Portfolios

### Unconditional Test as in Fama and French

Confidence  
of Rejection\*



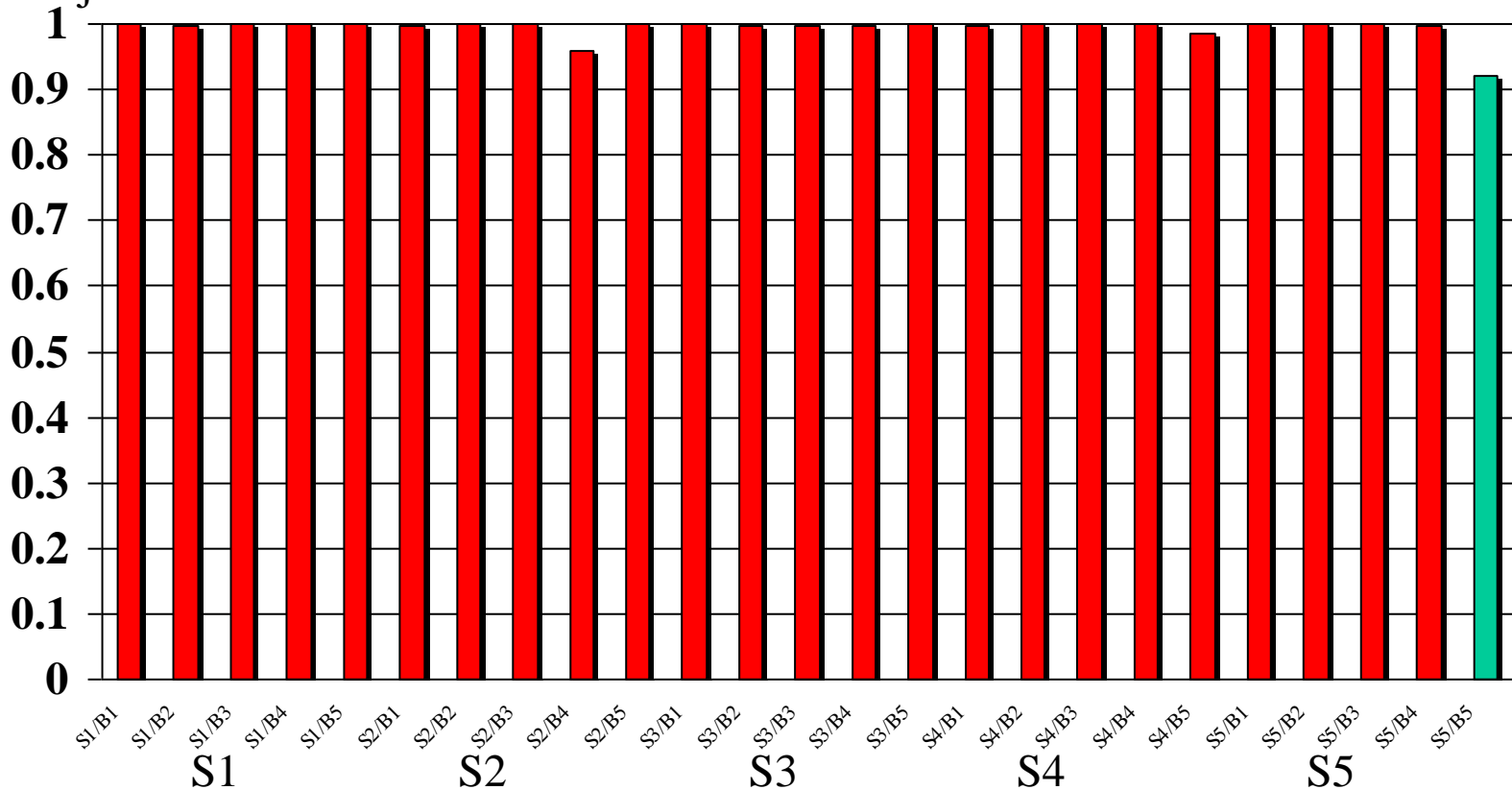
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# 5. Results: Are Intercepts Zero?

## Size and Book-to-Market Value Portfolios

Test whether intercept time-varying (assumes constant betas)

Confidence  
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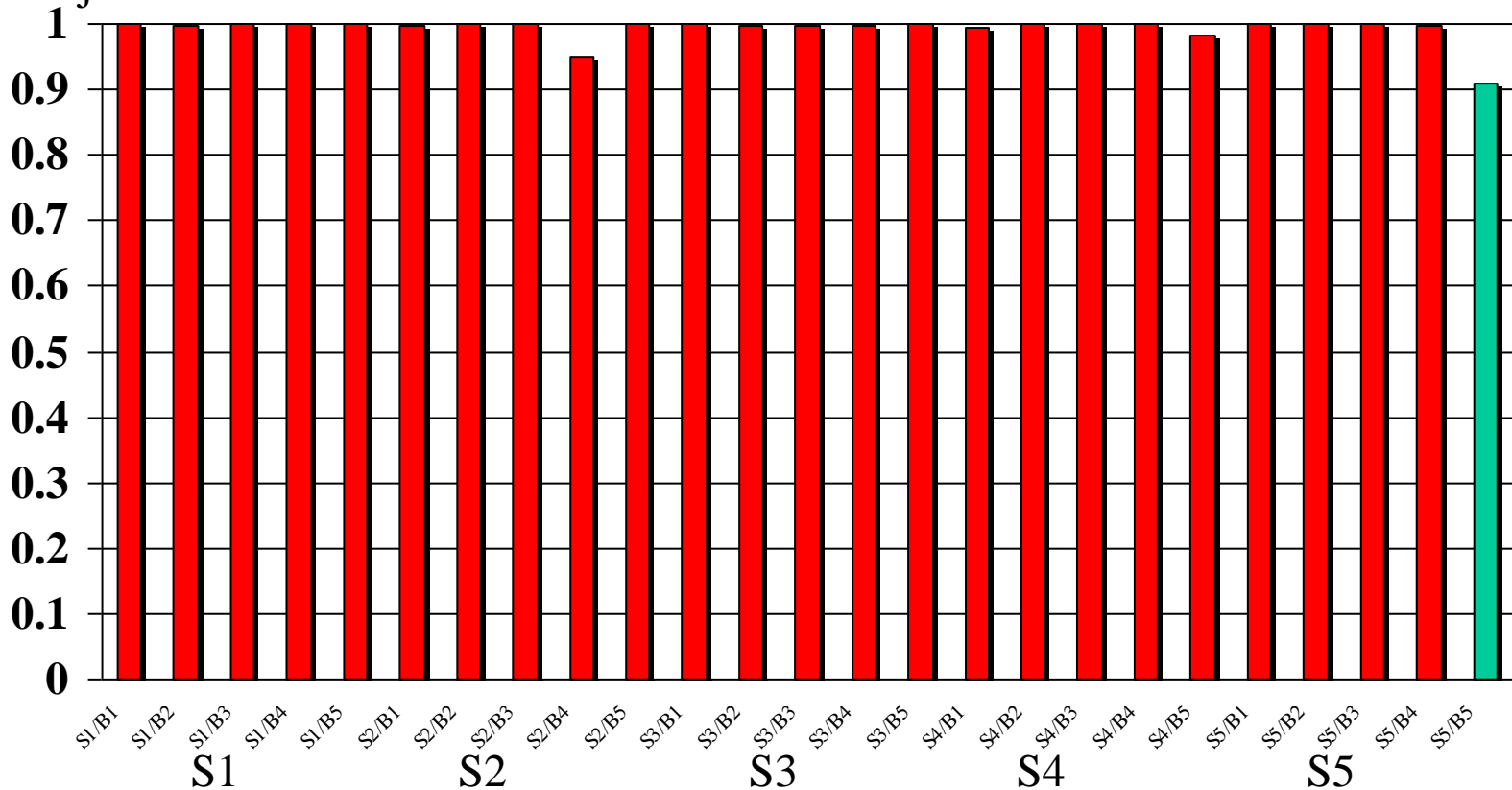
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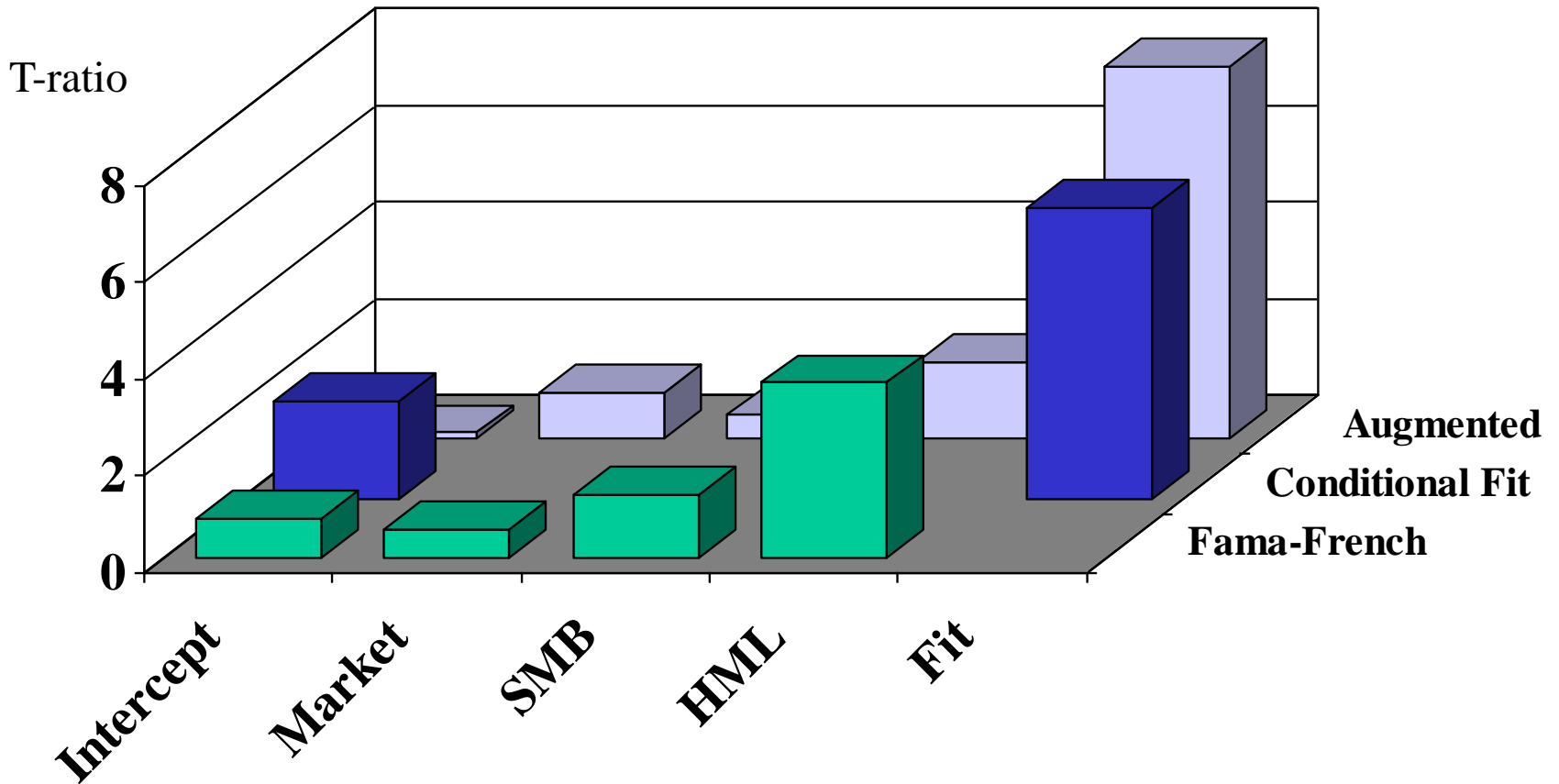


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# 5. Results: Cross-Section of Expected Returns

Size and Book-to-Market Value Portfolios

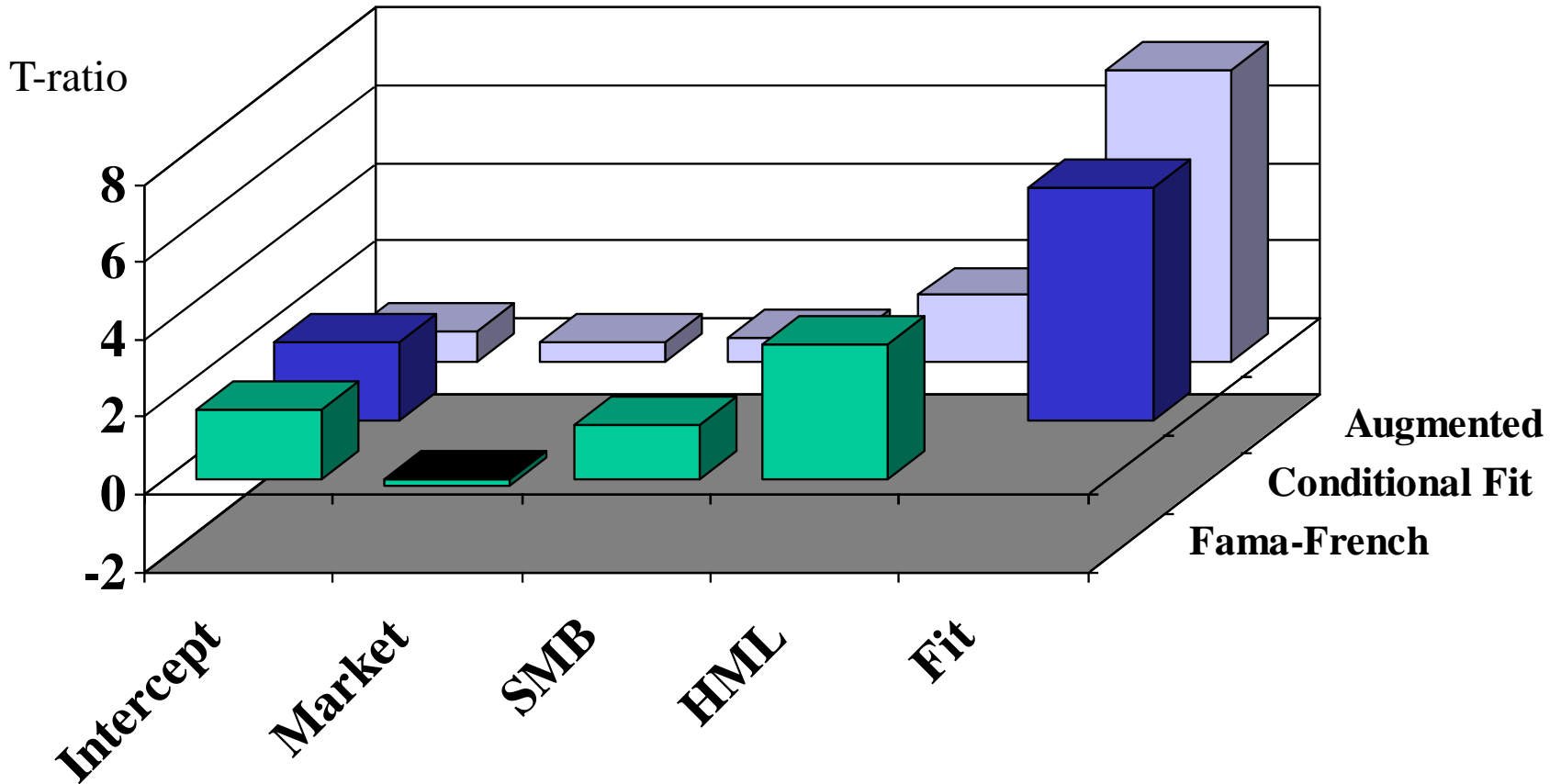
Standard Fama-MacBeth: Expanding sample betas



# 5. Results: Cross-Section of Expected Returns

Size and Book-to-Market Value Portfolios

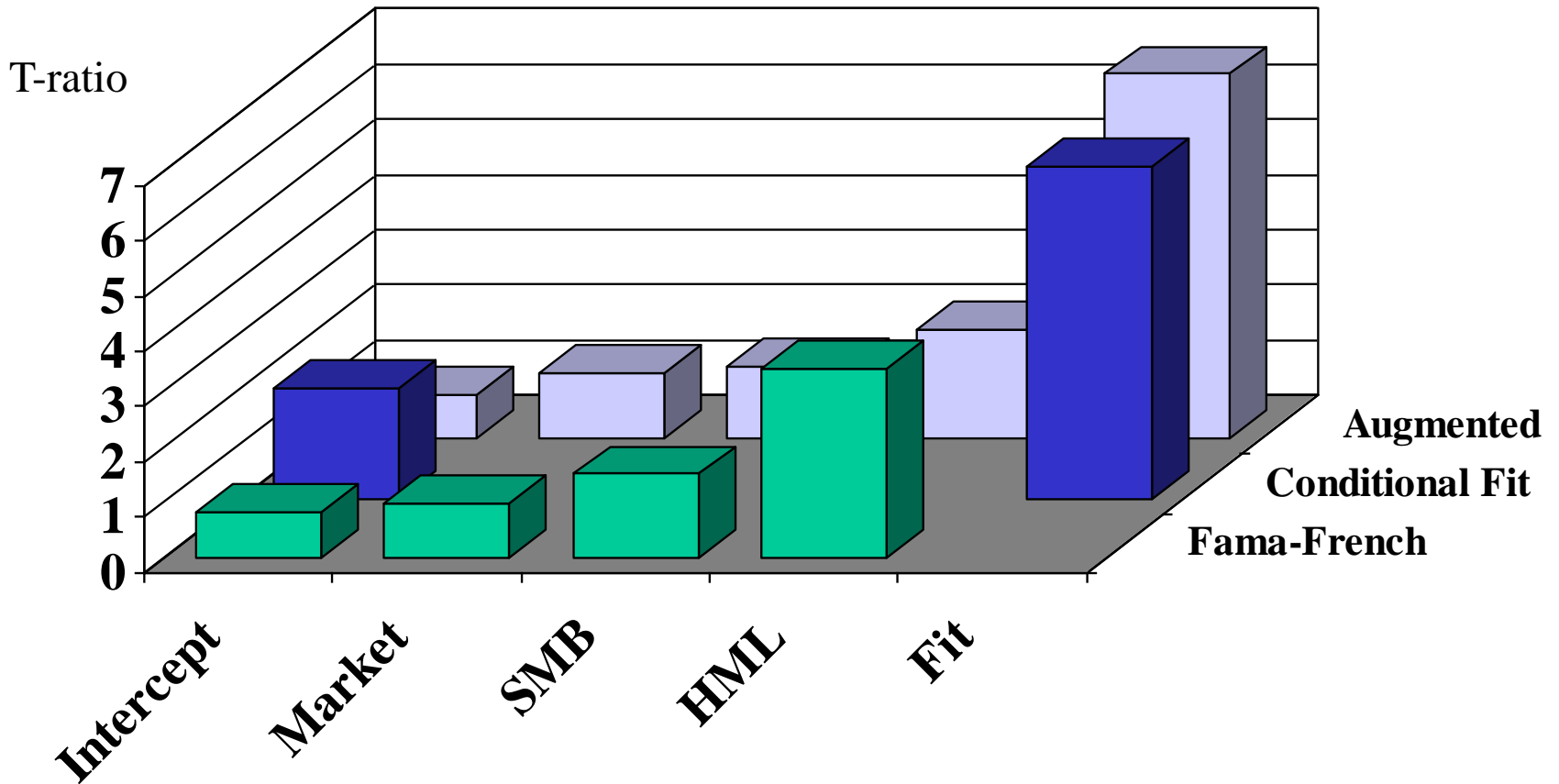
Standard Fama-MacBeth: Rolling 60-month betas



# 5. Results: Cross-Section of Expected Returns

Size and Book-to-Market Value Portfolios

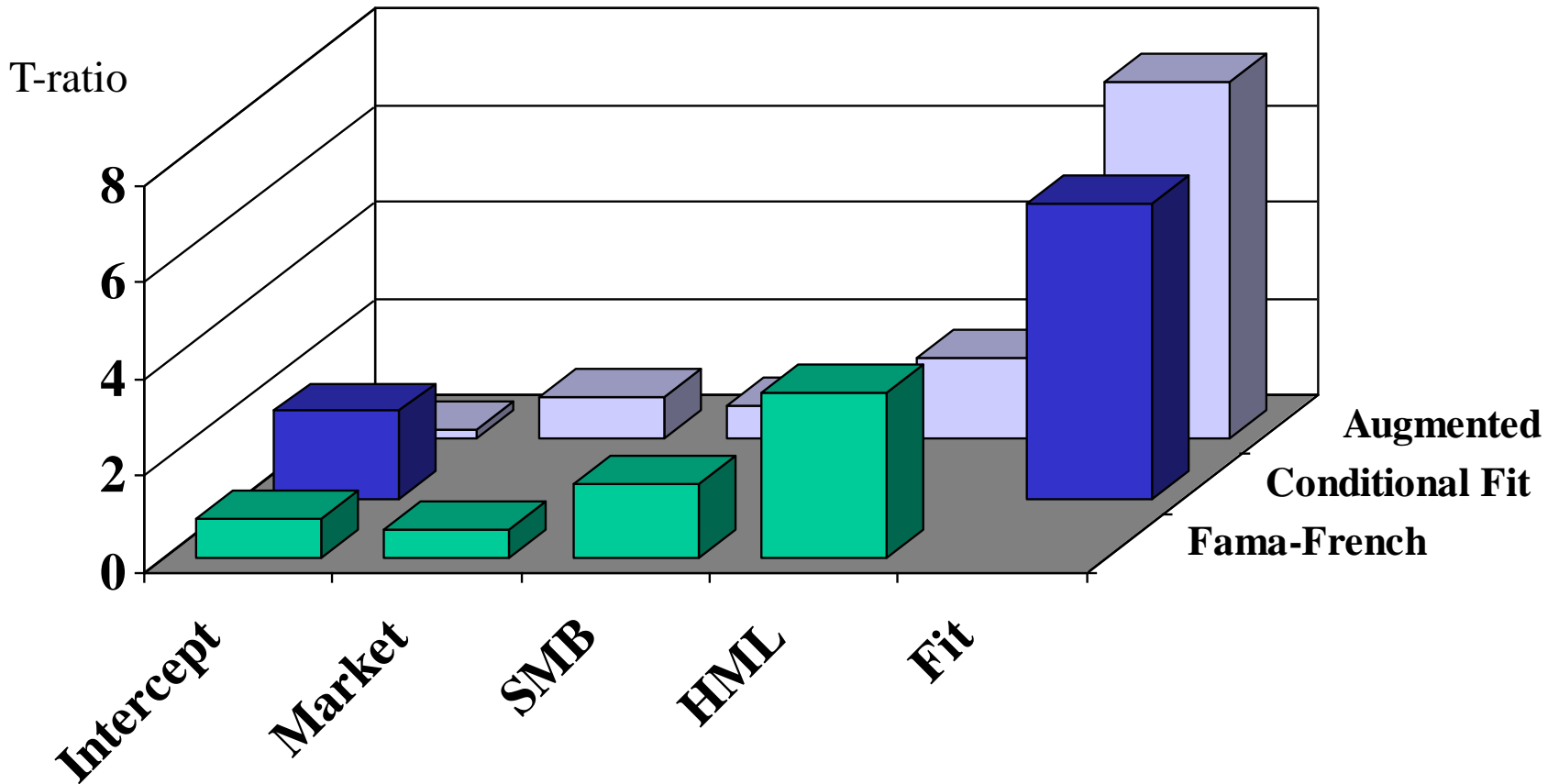
Standard Fama-MacBeth: Conditional betas



# 5. Results: Cross-Section of Expected Returns

Size and Book-to-Market Value Portfolios

WLS: Expanding sample betas

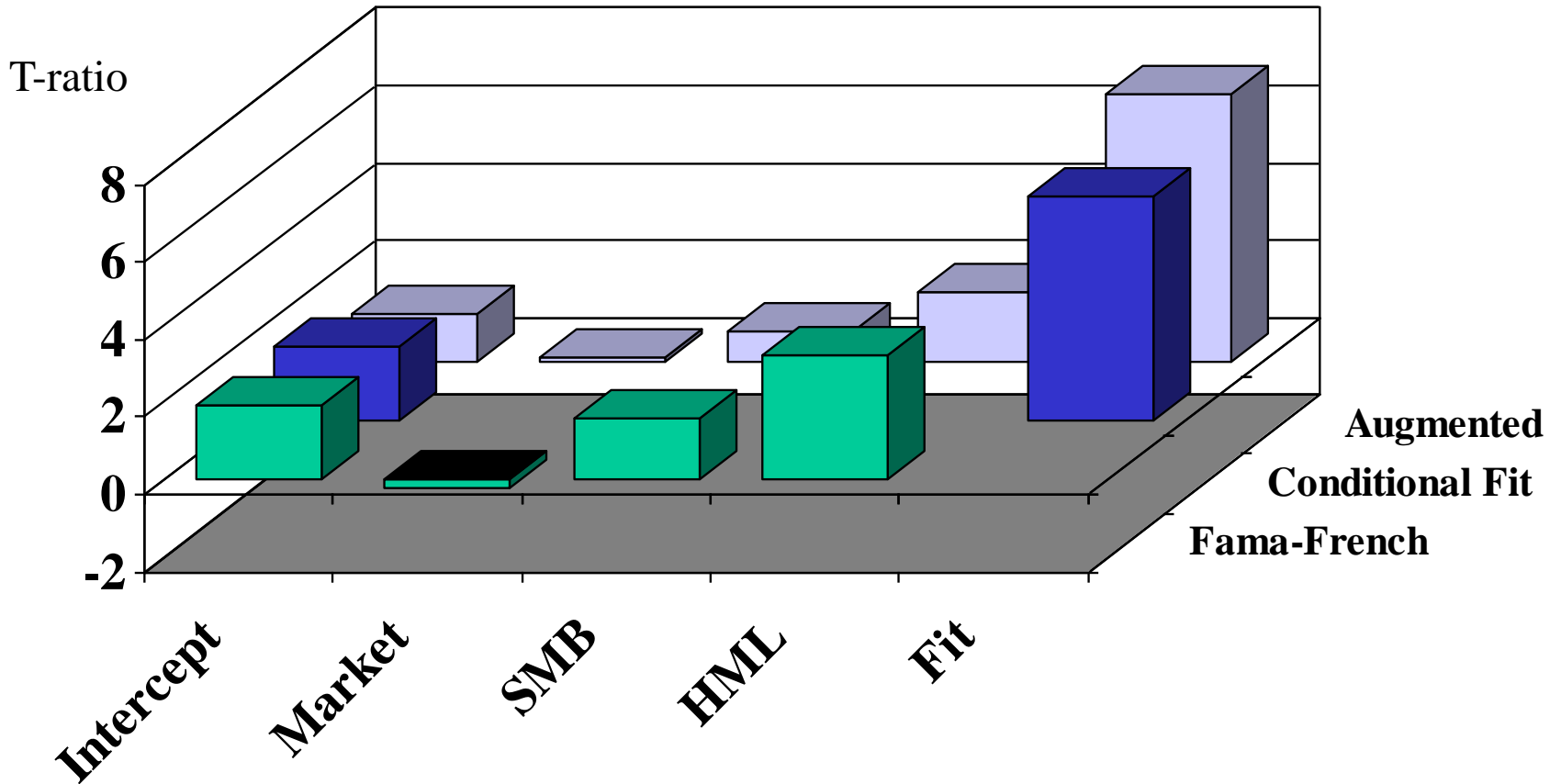




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Size and Book-to-Market Value Portfolios

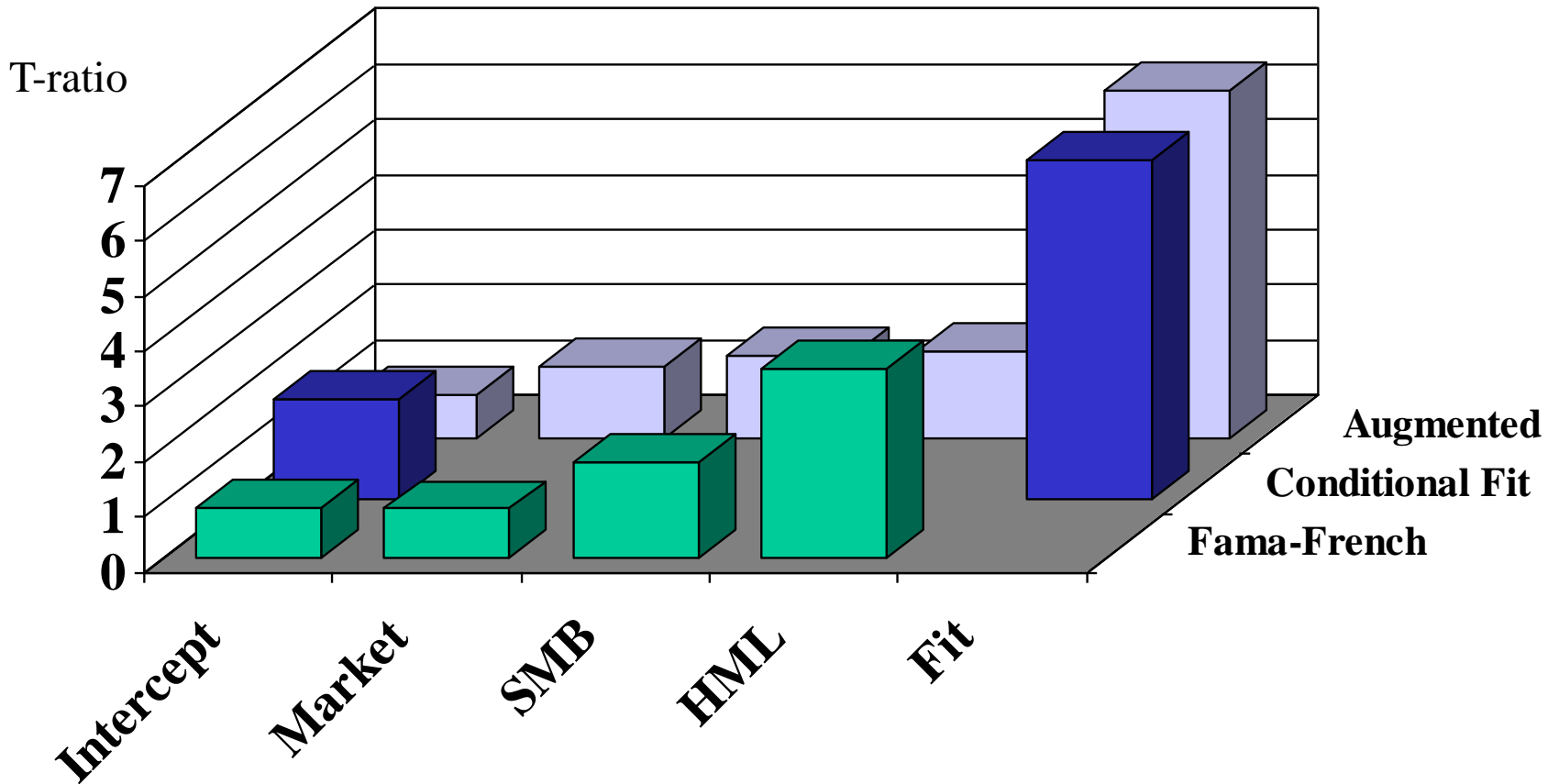
WLS: 60-month rolling betas



# 5. Results: Cross-Section of Expected Returns

Size and Book-to-Market Value Portfolios

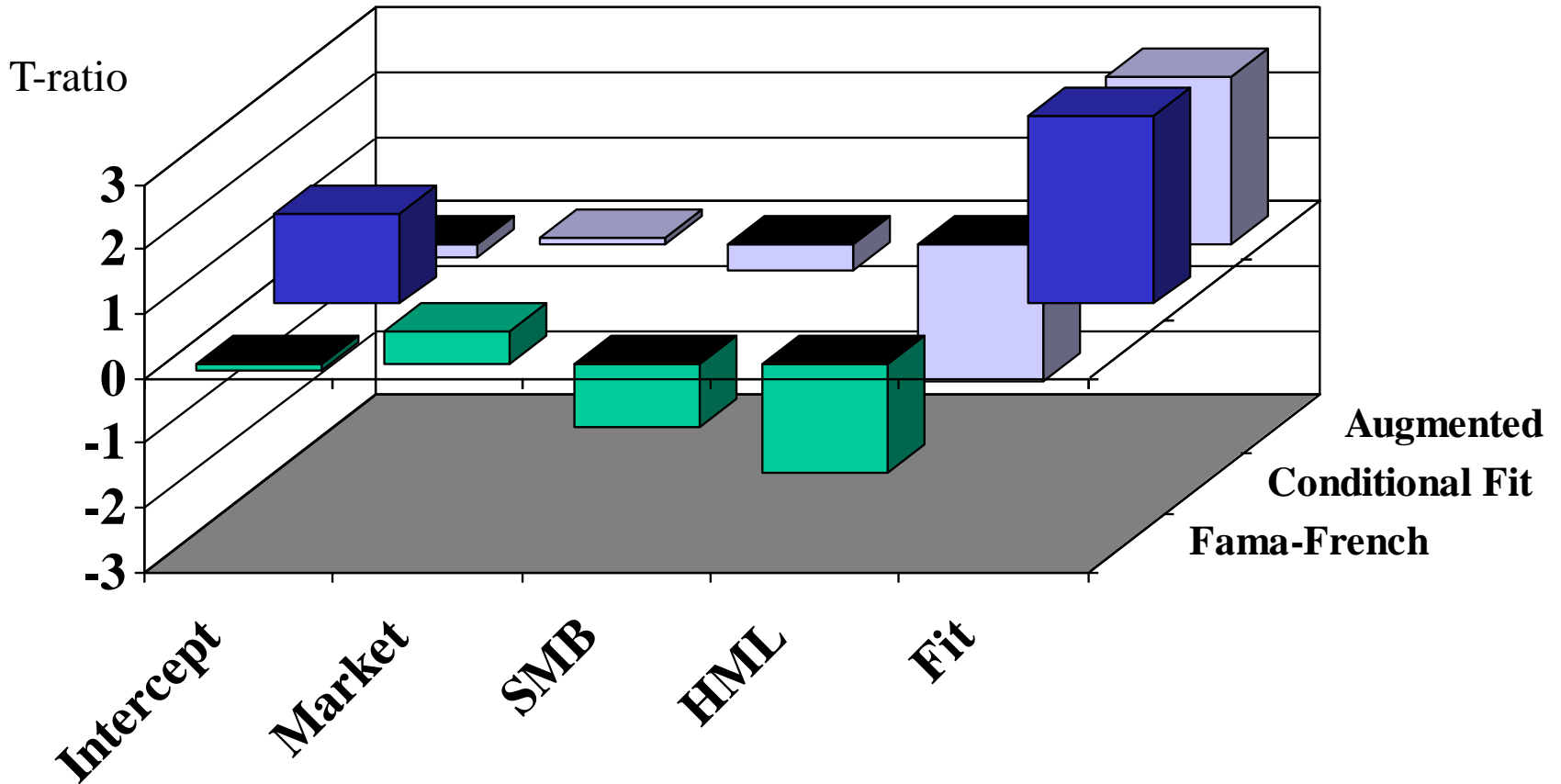
WLS: Conditional betas



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Size and Book-to-Market Value Portfolios

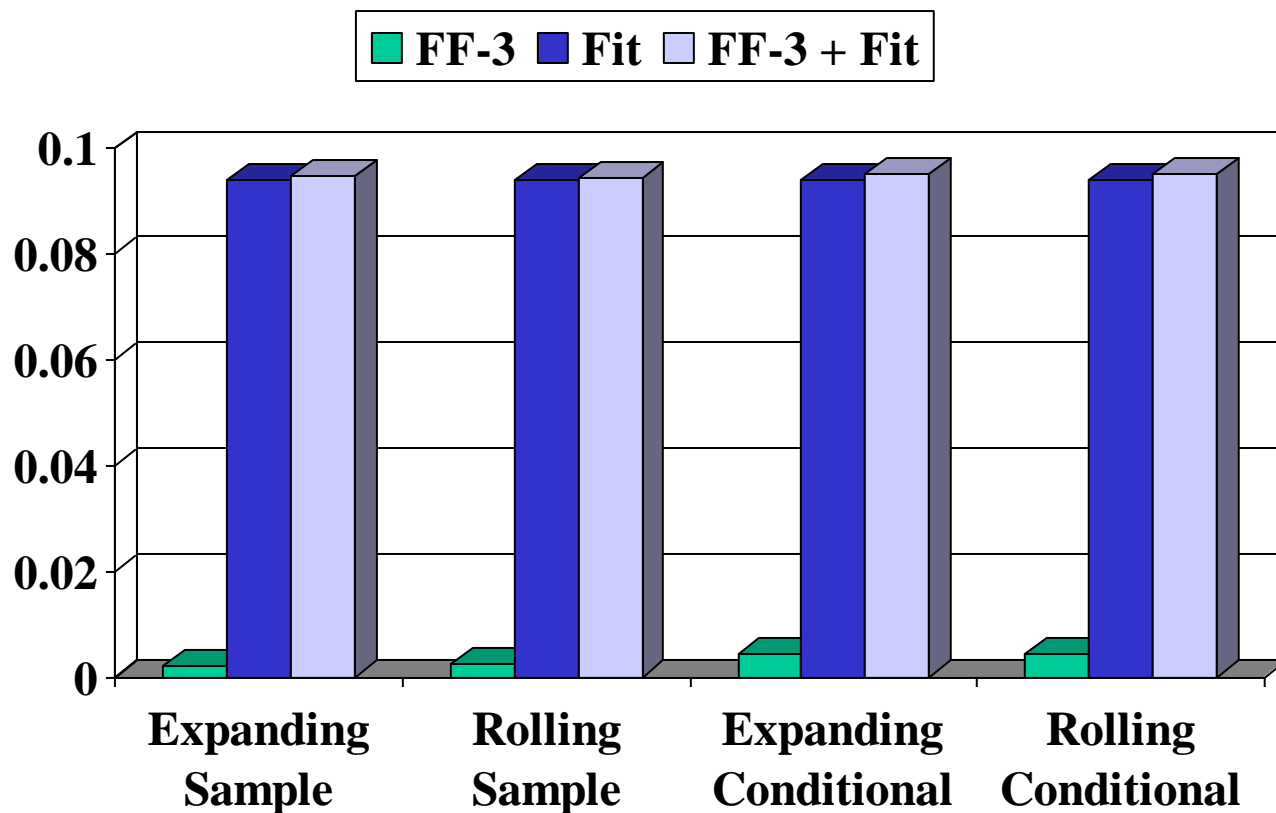
Efficient weighted estimates: Conditional betas



# 5. Results: Cross-Section of Expected Returns

## Size and Book-to-Market Value Portfolios

Panel regression  $R^2$



## 5. Results: Robustness

Results similar on:

- Industry portfolios,
- Size/BM/Momentum portfolios

## 5. Results: Robustness

Similar message if the portfolio attributes are used rather than the betas on the attributes

Conditional fit variable is not knocked out by fourth factor advocated by Elton, Gruber and Blake.

## 6. Conclusions

We believe that we have the first research to explore the relation between time-series and cross-sectional predictability.

1. Parameters of Fama and French change through time.
2. Fama and French model strongly rejected if conditioning information is included in the alpha
3. Time-series portfolio forecast helps explain the cross-sectional variation in expected returns