Class 10: Evidence from CAPM and APT II

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Today's Question

If CAPM only cares about beta, why do firm size and book-to-market also predict returns?

Is beta dead?

Positioning

Where We've Been	Where We Are	Where We're Going
Testing CAPM predictions against real data	Anomalies that challenge the CAPM	Factor models as a response (FF3)

Learning Objectives

By the end of today's class, you should be able to:

1. Describe additional CAPM predictions beyond the basic SML
2. Identify key anomalies (size, value, leverage) that challenge the CAPM
3. Interpret the Fama-French (1992) double-sort evidence
4. Explain Roll's critique and why "testing the CAPM" is harder than it looks

Other Predictions

CAPM predicts no other measures of risk will predict cross-sectional returns.

In particular, CAPM says only covariance risk matters:

- What about idiosyncratic risk?
- Fama-Macbeth (1973) control for idiosyncratic risk by including residual variances from firm time-series regressions in second-stage regression
- Also beta squared

$$r_i - r_f = \lambda_0 + \lambda_1 \hat{\beta}_i + \lambda_2 \hat{\beta}_i^2 + \lambda_3 \hat{\sigma}_\varepsilon^2 + e_i$$

They find that only β seems to matter — it's a linear relationship.

The Search for Anomalies Begins

However, we can go beyond beta-squared and residual variation to predict returns...

For example:

1. Earnings-to-price ratio $\longrightarrow$ high returns (Basu, 1977)
2. Market cap $\longrightarrow$ low returns (Banz, 1981)
3. Leverage $\longrightarrow$ high returns (Bhandari, 1988)
4. Book-to-market $\longrightarrow$ high returns (Statman, 1980)

All turn out to have predictive power over beta, in particular, size (market cap) and book-to-market.

So which wins in a race, beta or size?

The Search for Anomalies Begins

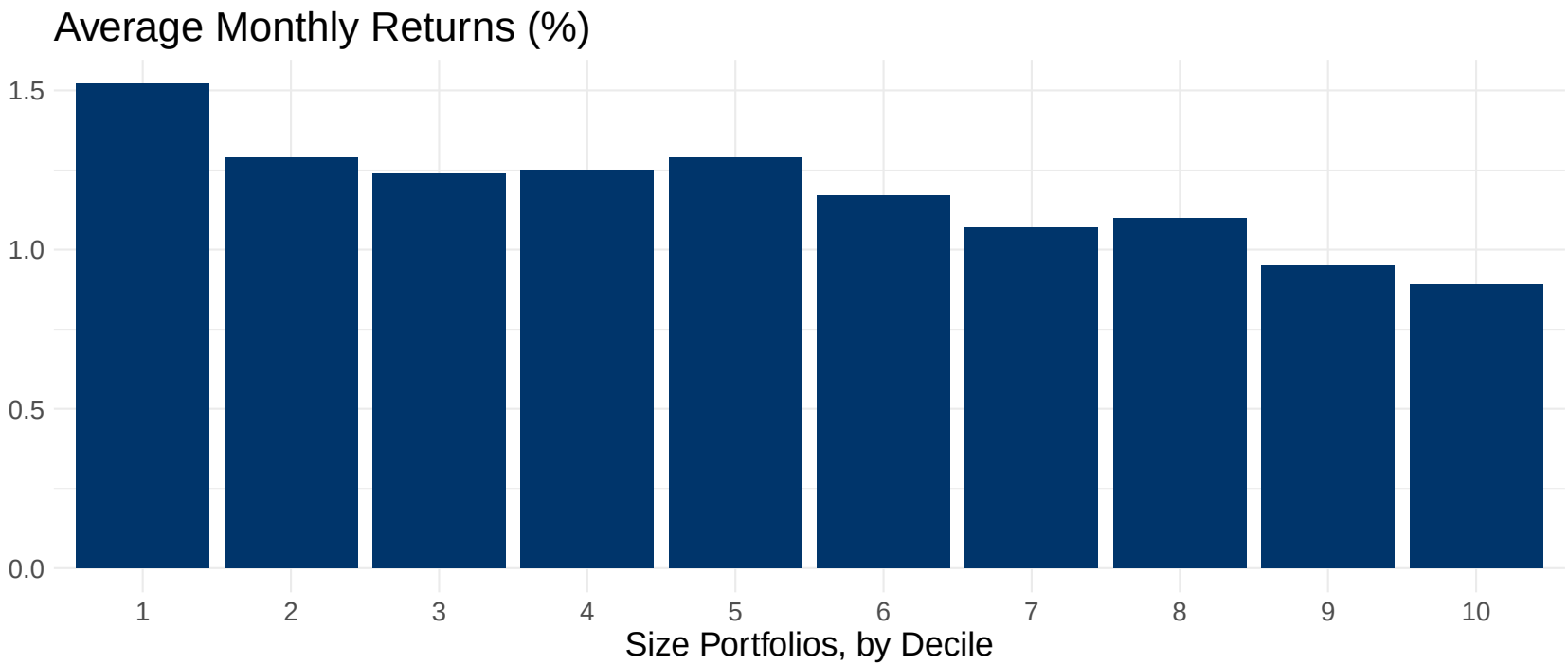
Fama-French (1992) test this by creating double sorted portfolios:

- First, sort firms on size; then, sort on beta (covariance with market)
- Can do the same with book-to-market

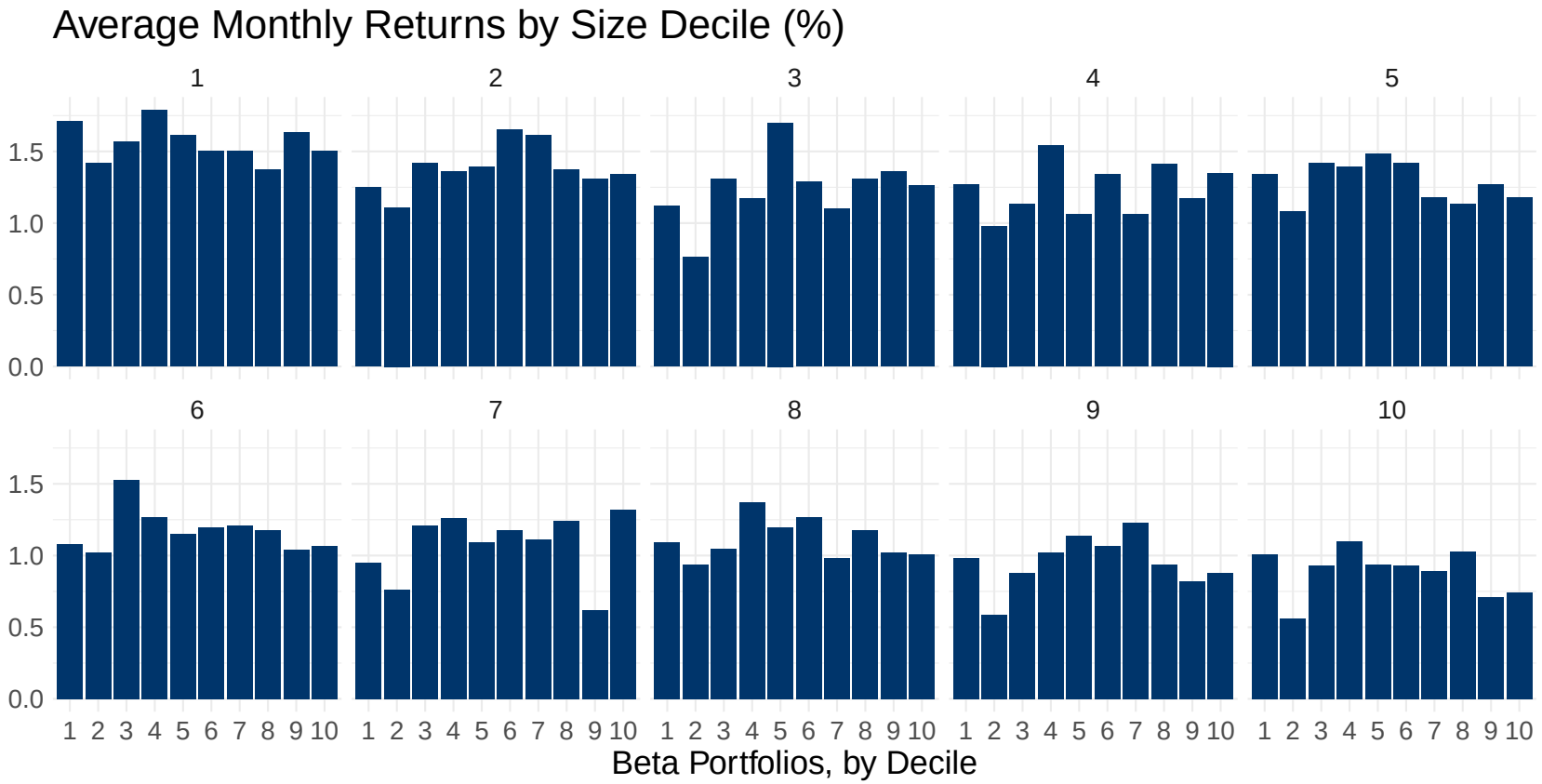
Set up a horse-race between beta and the two other factors.

If beta is a good predictor, it should predict even within a bin of similarly sized firms.

Average Returns by Size Portfolios (Fama-French 1992)

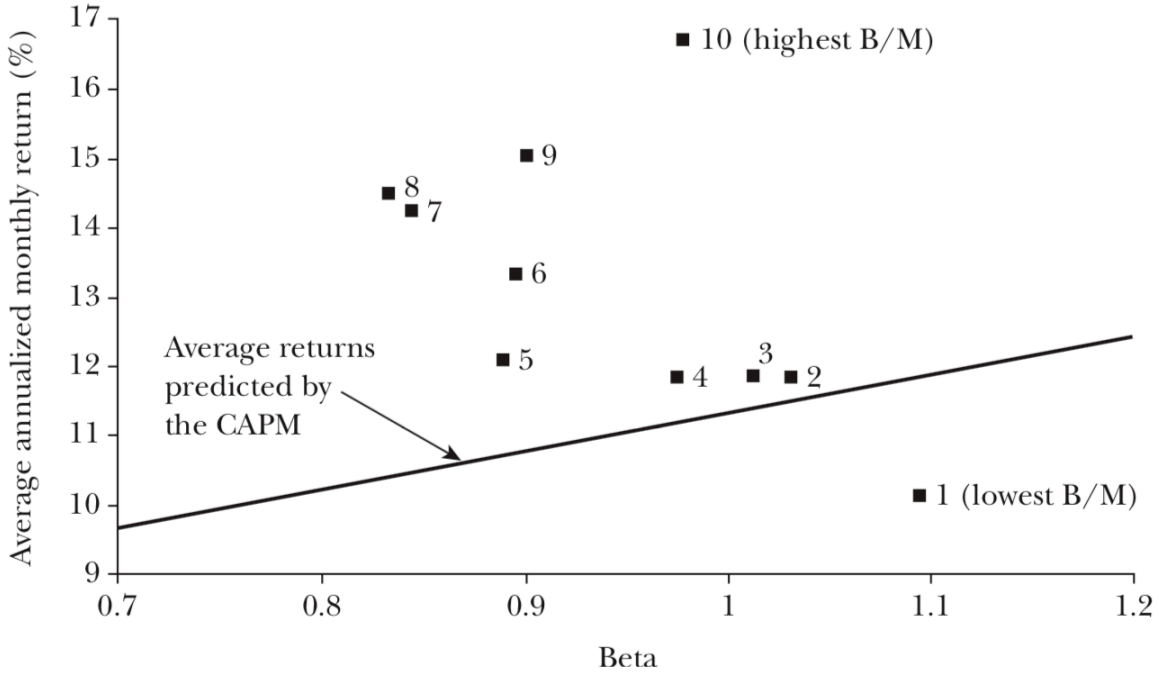


Average Returns by Size Decile (Fama-French 1992)



Book-to-Market vs Beta

Average Annualized Monthly Return versus Beta for Value Weight Portfolios Formed on B/M, 1963–2003



Is Beta Dead?

30 years after its birth, hard to say that CAPM isn't dead.

In reality, however, hard to say if CAPM or tests of the CAPM are flawed.

Roll's critique:

- Tests of the CAPM are infeasible because the market portfolio is unobservable
- Tests of CAPM are only tests of the efficiency of the market proxy used

Key implication: We can never definitively reject the CAPM — only reject specific proxies for the market portfolio.

Next Class: February 24

Topics: Evidence from CAPM and APT III

- Factor models as a response
- Fama-French 3 factor model
- More factors: momentum, liquidity

Matt Levine Reading: TBD