

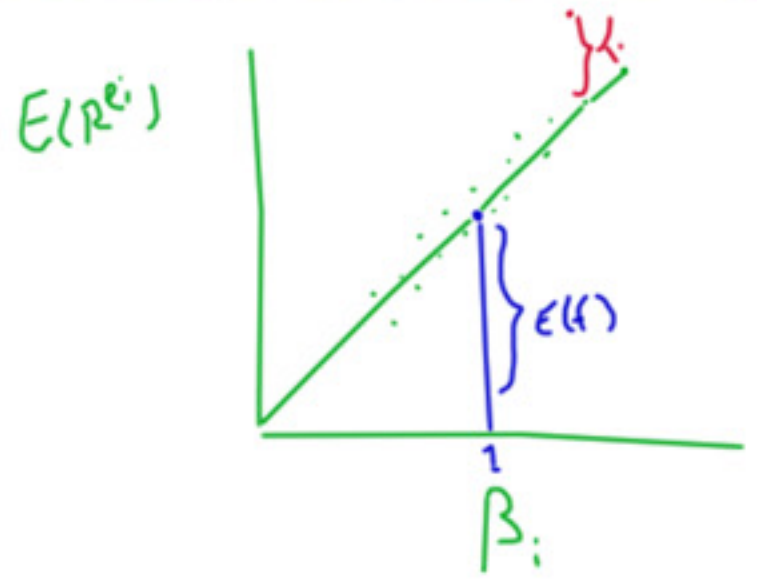
1. THE FF 3 FACTOR MODEL INTRO AND ER

P.55

"MANY PATTERNS" - $E(R^i)$, CAPM FAILS

MODEL

ANOMALIES PRE CAPTURED... $E(R)$ IS EXPLAINED BY SENSITIVITY (β)



$$E(R_i) - R_t = b_i [E(R_M) - R_t] + s_i E(SMB) + h_i E(HML) \quad (1)$$

WHERE $[b, h, s]$

$$R_{it} - R_{ft} = a_i + b_i (R_{Mt} - R_{ft}) + s_i SMB_t + h_i HML_t + \epsilon_{it} \quad (2)$$

$$E(R^i) = (a_i) + \beta_i E(f)$$

$$R_{it}^e = a_i + \beta_i f_t + \epsilon_{it} \quad i=1 \dots T$$

DATA

VALUE (BOOK PRICE * SHARES)

SMALL PRICE X SHARES = "MARKET CAP"

...
...
...
...
...

25 PORTFOLIOS

SMALL ↑

VALUE		
L	S	H
B		

3 FACTORS

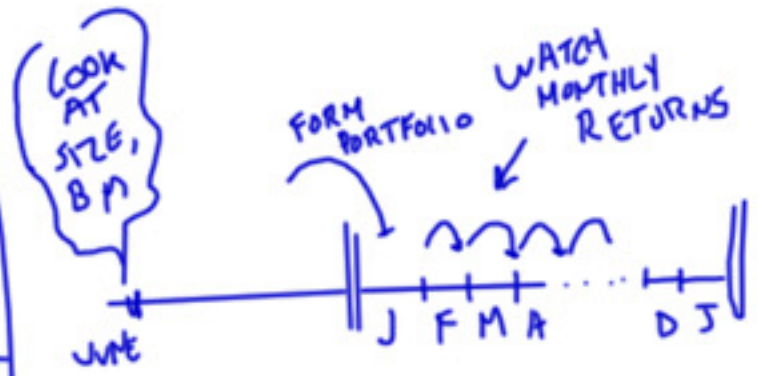
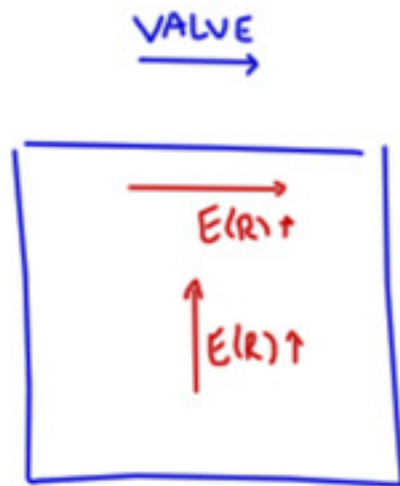


TABLE 1A

↑
SMALL
|



VALUE →

• SMALL, VALUE HIGHER $E(R)$



• β DOES NOT WORK



SEE "ASSET PRICING" β

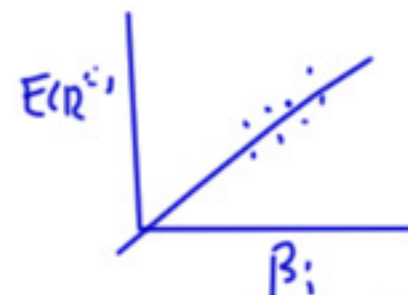
2: THE FF MODEL

TABLE 1B - REGRESSION (2)

- b, h RISE WHEN $E(R)$ RISE (GRAPH)
- α_i ARE SMALL (?) [MOSTLY; ECONOMICS VS STATISTICAL SIZE]
- $Y = Xb + \epsilon$ t STAT ON b, h PIRE HUGE: IMPORTANT?
- R^2 IS HUGE! IMPORTANT?

P.56 "A PARSIMONIOUS DESCRIPTION OF RETURNS / AVERAGE RETURNS"

- R^2 "EXPLAIN VARIATION [OVER TIME] IN RETURNS"
- α "EXPLAIN VARIATION [ACROSS PORTFOLIOS] IN AVERAGE RETURNS"



$$\frac{\sum \alpha_i^2}{\sum (E(R^i) - \overline{E(R^i)})^2}$$

"(CROSS SECTIONAL R^2)"
(DANGER)

$R^2: R^e_i = \alpha_i + \beta_i f_t, R^2=1 \Rightarrow \text{cov}(R^e_i, R^e_j) = \beta_i \beta_j \sigma_f^2$ "FACTOR STRUCTURE"
 → MODEL "EXPLAINS" COVARIANCE NOT MEAN
 → INPUT APT ASSUMPTION GOOD

⇒ TABLE 1B IS DATA FOR MAIN ER POINT! NOT RESULTS!

P.57 "TEST" $\sum \alpha_i^2 = 0$?

- THE MOST FAMOUS MODEL OF THE LAST 40 YEARS IS DECISIVELY REJECTED!
- "CLASS IS 90% FULL" SHOW THE DATA STYLE!

3. USING THE 3 FACTOR MODEL

'TAUTOLOGY? - AP? → OTHER PUZZLES

TABLE II

- BUY STOCKS WITH STRONG SALES GROWTH (GOOGLE)
OR
DISASTROUS SALES DECLINE (SEARS)?
- β SHOULD EXPLAIN. FAILS

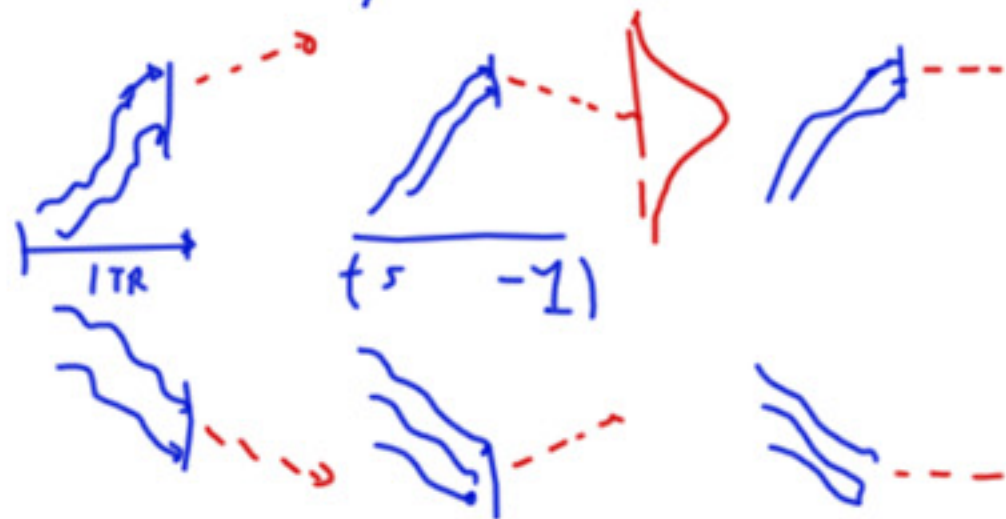
TABLE III

- 3F $b, h, s, \alpha \leftrightarrow ER$
- HAVE WE SHOWN SLOW SALES ARE VALUE STOCKS?
- SLOW SALES BEHAVE LIKE VALUE STOCKS -
THEIR $E(R)$ GIVES NO ADVANTAGE OVER HML
- "EXPLAIN" SALES ANOMALY GIVEN $E(HML)$! ZOO

4. MOMENTUM REVERSAL

TABLE VI

- DO STOCKS SHOW MOMENTUM, REVERSAL, OR RANDOM WALK?



- TVI
- CAPM FAILS
- FF REVERSAL - "EXPLAIN" GIVEN HML, E(HML)
- FF MOMENTUM - DISASTER
- SINCE FF: ① "UMD" WINNER-LOSER "EXPLAINS" 1-10 MOMENTUM.
② DID NOT GO AWAY (YET)

④ 4 FACTOR IS ROUTINE, RMRF, HML, SMB, UMD.

5. WHAT IS THE FF 3F MODEL

CAPM $E(R^i) = (\alpha_i) + \beta_i E(R^m)$

Now

$$E(R^i) = (\alpha_i) + b_i E(R_{MRF}) + h_i E(HML) + s_i E(SMB) [+u_i E(UMD) + \dots]$$

- "EXPLAIN" ^{P.76} NEW GIVEN KNOWN . EVALUATE MANAGERS.
- PRACTICAL "APPLICATIONS" P.76
- MODELS? APT, CAPM, ICAPM, MULTIFACTOR, ETC?
DEEPER "EXPLANATION"? WHICH IS FF3F
- P.76 "PARSIMONIOUS DESCRIPTION OF R, ER"
→ APT! R? HUGE!
"PORTFOLIOS CLOSE TO MMU" MVF \leftrightarrow $E(R) = \beta \cdot$

"WE HAVE NOT IDENTIFIED STATE VARIABLES" .. MIMICING PORTFOLIO THEOREM

P.77 STORY OF STATE VARIABLES - HUMAN CAPITAL MULTIFACTOR MODEL

POINT . WHY DOES $E(HML) > 0$!

"RULES OF THE GAME" / AVOID FISHING

WHY SO RELUCTANT TO CALL UMD A FACTOR? - DESIRE TO "EXPLAIN"

FINAL THOUGHT

FF STYLE MODEL

- ANOMALY ORGANIZATION
- DATA REDUCTION. 3 (4) PREMIUMS, MANY GUSES.
- "THEORY" ONLY NEEDS TO EXPLAIN $E(MRF), E(HML)$ ETC..

MOST IMPORTANT RULE

$$E(R_i) = a + b(\text{SIZE}_i) + c(\text{B/M}_i) ?$$

* FAMA FRENCH MODEL SAYS SMALL /
UNLVESTOLGS GET HIGHER RETURNS!

- DESCRIPTION VS EXPLANATION
- CHARACTERISTIC VS BETA
- WHO YOU ARE VS HOW YOU BEHAVE
- IF SO FORTUNE TO BE MADE!
- "EXPLANATION" MUST HAVE β 'S

$$E(R_i) = \underline{b}_i E(R_{MKT}) + \underline{h}_i E(HMI) \dots$$

OPTIONS 1 INTRO AND PAYOFFS

- OBJECT: OPTION PRICE \leftarrow STOCK + BOND; "RELATIVE PRICING" NOT "EXPLANATION"
- METHOD: $P = E(Mx)$ LEARN ABOUT M FROM S, B.
- WAS "ARBITRAGE" NOW LESS SO

