

ECON 4360: Empirical Finance

The Fama-French Papers

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Empirics Lecture #06

What are we doing today?

- Discussion of the Fama-French Papers
 - Fama and French (1992): The Cross-Section of Expected Stock Returns, Journal of Finance
 - Fama and French (1993): Common Risk Factors in the Returns on Stocks and Bonds, Journal of Financial Economics

- Motivation: Expected returns should be related to their market betas, and market betas should be sufficient to describe the cross-section.
 - Is this true?

- Fama-MacBeth (1973) Cross Sectional Regression Approach!
 - The cross-section of returns are regressed on potential explanatory variables. (Monthly)
 - The time-series means of the regression slopes give a test of whether or not those variables are "priced"
- Note: Individual stocks are used in the FM asset-pricing tests, but market betas are assigned to each individual stock through an estimate of the market beta on the portfolio to which it belongs.
Why?
 - Estimates of market betas for portfolios are more precise than for individual stocks.

- Size is negatively related to expected returns
 - Banz (1981): Small firms (those with low market equity (ME - a stock's price times outstanding shares)) have average returns that are too high, given their market beta estimates.

- Book-to-Market is positively related to expected returns
 - One possible story, e.g., is the relative distress factor of Chan and Chen (1991):
 - High book-to-market firms that the market judges to have poor prospects
 - I.e., signalled by low stock prices / high book-to-market
 - They must have higher expected stock returns (than firms with stronger prospects) to compensate investors for the risk
 - An equivalent way of saying this is that these firms are penalized with higher costs of capital.

- Summary of results:
 - There is no reliable relation between the market beta and average return, controlling for size
 - Size and book-to-market capture the cross-sectional variation in average stock returns.
 - Return variation related to E/P is absorbed by the combination of size and book-to-market
 - Roles of market leverage and book leverage are captured by book-to-market
- Main results are in Table III (p. 439)...

FF 1992: Market beta

- Is there no role for the market beta? Really???
- FF (1992) find that variation in beta related to size is positively associated with average return; but variation in beta unrelated to size is not.
 - This implies that controlling for size, there is no relation between beta and average return.
- Then why does the SLB (Sharp (1964), Lintner(1965), and Black (1972)) model ever even come into play in the first place?
 - When were these studies done?
 - There was a relation in the 25 year period from 1941-1965, but that too disappears when controlling for size.

Turning Now to FF 1993...

- What is the motivation for the paper?
 - Things that should explain asset prices well (as motivated by our theories) don't.
 - Single factor asset pricing models using either the market beta or a consumption beta do not explain the cross-section of average returns well.
 - Factors that do have explanatory power have no special theoretical justification in asset pricing theory.
 - And there are many possibilities, including size (ME, stock price times number of shares), leverage, E/P, book-to-market equity (BE/ME)

- Fama-French (1992) finds that size and book-to-market do a good job of explaining the cross-section of returns for US stocks.
- Why the 1993 extension?
 - A single asset pricing model should be able to explain bonds, as well as stocks.
 - The 1993 extension adds in US government bonds and corporate bonds.
 - Might other explanatory variables be important if bond returns are also to be explained?
 - Key question: Are variables that are important in explaining bond returns also helpful in explaining stock returns (and v-v)?

- Why does Fama-French (1993) use a time-series approach instead of cross-section regressions?
 - Cross-section regressions don't make sense for bonds, since the explanatory variables like size and book-to-market equity have no obvious meaning for bonds
- What does the time-series approach do differently?
 - Regresses stock and bond returns on
 - Returns to a market portfolio of stocks
 - Mimicking portfolios for size and BE/ME
 - Term-structure risk factors in returns
 - The time-series regression slopes are factor loadings interpreted as risk-factor sensitivities. This works for stocks and bonds.

Rationale?

- Variables related to average returns (like size and BE/ME) are proxying for sensitivity to common (shared and undiversifiable) risk factors in returns.

Why Excess Returns?

- A test of how well the model does can be found from looking at the intercepts. (They should be zero!)
 - Excess returns are specified as R^i less the 1-month T-bill rate
- How can different models be tested?
 - FF take different combinations of the explanatory variables and judge their relative performance on how close their intercepts are to zero.
 - Note that formulating excess returns in this way implicitly makes the asset pricing model account for the one-month T-bill rate!

The Data: Explanatory Variables

- Bond Market Factors: What are the common risks?
 - Unexpected changes in interest rates
 - Proxy: TERM - the difference between monthly long-term govt bond returns from the one-month T-bill rate
 - Shifts in economic conditions that affect default probability (for corporate bonds)
 - Proxy: DEF - the difference between the return on a market portfolio of long-term corporate bonds and the long-term government bond return

The Data: Explanatory Variables

- Stock Market Factors: What are the common risks?
 - BE/ME
 - A firm with a high BE/ME has a low stock price relative to book value and has persistent low earnings
 - Why? Suggests that relative profitability is the source of a common risk factor in returns
 - Size
 - Controlling for BE/ME, small firms have lower earnings on average than large firms.
 - Why? Perhaps because long earnings depressions can bypass large firms, so size might be a common risk factor

Explanatory Variables: Building Blocks

- Six stock portfolios sorted on ME and BE/ME
 - Stocks are split into two groups: small (S) and big (B)
 - Stocks are split into three book-to-market groups: Low, Medium, and High
- These splits give the six portfolios: S/L, S/M, S/H, B/L, B/M, B/H.
- Factor: SMB (small minus big)
 - Difference each month between simple average of returns on (S/L, S/M, S/H) and (B/L, B/M, B/H)
- Factor: HML (high minus low)
 - Difference each month between simple average of returns on (S/H, B/H) and (S/L, B/L)
- Now FF have a set of monthly "mimicking returns" for size and book-to-market factors.

Explanatory Variables: Building Blocks

- The Market Factor
- Proxy is the excess market return, $RM - RF$.
 - RM is the return on the value-weighted portfolio of the stocks in the size-BE/ME portfolios
 - RF is the one-month T-bill rate.

Explanatory Variables: Building Blocks

- What next? What are the average risk premiums for the common factors?
- Just the average values of the explanatory values.
 - Interpretation: The factor X produces an average premium of $x.x\%$ per month, where the average premium is just a simple average of time over the set of returns for the X factor

Data: What to Explain

- Stocks
 - 25 portfolios: formed on size (5 quintiles) and book-to-market (5 quintiles)
- Bonds
 - Two government portfolios: 1-5 years and 6-10 years
 - Five corporate bond portfolios: Grouped on ratings Aaa, Aa, A, Baa, and LG.
- (All are excess returns)

Some Results

- Bond Market Factors (Table 3)
- Stock Market Factors
 - Excess Market Returns (Table 4)
 - SMB and HML (Table 5)
 - RM-RF, SMB, and HML (Table 6)
- Five Factors (Stock and Bond Market Factors - Table 7)
 - Contradicts the results in Tables 3 and 6 that say there is common variation in bond and stock returns when bond- and stock-market factors are used alone to explain returns. Can we reconcile these results?

Main Results: Stocks

- For stocks, the best results come from the three-factor model of the market factor and the mimicking returns for size and BE/ME.
- Why does FF (1993) need the market factor, when FF (1992) did not?
 - The size and book-to-market factors explain the cross-section of returns, **but they cannot account for the difference between average returns and the 1-month T-bill rate!**
 - The risk premium accounted for by the market factor is what links the average returns. How can we tell?
 - In the three-factor model for stock portfolios, slopes on the market factor are close to one.

Main Results: Bonds

- For bonds, the best results come from a two-factor model with mimicking portfolios for the two term-structure factors - a term premium and a default premium.

Main Results: Links between Stocks and Bonds?

- Five Factors (Stock and Bond Market Factors - Table 7)
 - Contradicts the results in Tables 3 and 6 that say there is common variation in bond and stock returns when bond- and stock-market factors are used alone to explain returns. Can we reconcile these results?
 - For stocks, TERM and DEF are buried in the excess market return. But the two bond market factors are common to stocks (See also Table 8!)
 - The three stock-market factors are only relevant for stock market returns (not bonds).
 - Conclusion: Links between stock and bond returns come largely from the two shared term-structure factors
- Why RMO? (Table 8)
 - Separates out roles of bond- and stock-market factors. RMO is orthogonal to the other four factors. (If there are multiple common factors in stock returns, they are all in RM-RF).
 - Note: SMB and HML are largely uncorrelated with TERM and DEF!

- How well do the average premiums for the five proxy risk factors explain the cross-section of average returns on bonds and stocks?
 - Note 1: TERM and DEF can capture substantial common variation in bond and stock returns (they are volatile), but can't explain much of the cross-sectional variation in average stock returns (since their low levels of returns are puny). (The latter is indicated by the intercept tests.) Can explain that for bonds.
 - Note 2: Joints tests: All rejected.
 - Note 3: Useful in practical application? Only one out of 25 three-factor regression intercepts for stocks (smallest size and lowest BE/ME) is much different from zero.

- Are you convinced by the diagnostics?

- Interpretations

- RMO: The premium for being a stock (rather than a 1-month T-bill)
- TERM and DEF: Explain almost none of average excess returns on stocks; but produce interesting time-series variation in expected bond and stock returns
- TERM and DEF: Explain almost all of common variation in high-grade corporate returns (and explain excess returns - i.e., low returns)
- SMB and HML: Explain cross-sectional differences in stocks.
- Choice of these particular versions of the factors? Arbitrary. Implies detailed stories for slopes and average premiums are suggestive, not definitive.

End of Today's Lecture.

- That's all for today.