CorpFin Module 12, Market Efficiency: practice problems

Brealey and Myers Chapter 13 Efficient markets

(The attached PDF file has better formatting.)

** Exercise 12.1: Efficient market hypothesis

- Series Y = S_1, S_2, S_3, … = the stock prices for stock ABC on successive days.
- Series Z = S_2 / S_1, S_3 / S_2, S_4 / S_3, … = the stock price changes for stock ABC on successive days.

Assume the efficient market hypothesis is true.

A. What is meant by serial correlation?
B. Does the series Y have positive, negative, or zero serial correlation?
C. Does the series Z have positive, negative, or zero serial correlation?

Part A: The time series on-line course explains serial correlation (or autocorrelation) in depth; the regression analysis course explains it more briefly. We give here a lay explanation using stock prices.

A white noise process has no serial correlation. Each observation in a white noise process is a random draw from a distribution. The observation in Period *t* is unrelated to the observation in Period *t+1*.

Illustration: A statistician walks through a park, asking people to pick an integer from 1 through 9. At the of the study, the statistician has a list of 200 integers. The observations are unrelated, since each person has no knowledge of the integer chosen by the previous person.

Sometimes, the observation in Period t is a good predictor of the observation in Period t+1. For example, suppose the statistician checks a thermometer in the park every hour. If the temperature is high (above average) at 10 o'clock in the morning, it will probably be high at 11 o'clock. The series has positive serial correlation. In addition, this series has clear daily cycles (temperatures rising from daybreak to about 3 o'clock in the afternoon and then falling until daybreak) and annual cycles (temperatures rising from the end of winter through the end of summer and falling from the end of summer to the end of winter).

The series Y has strong positive serial correlation. If the stock price is high on Monday, we expect it to be high on Tuesday as well. The stock price is not a random draw, with high and low prices randomly distributed through the week.

Stock prices are a random walk, meaning that the change in the stock price is a white noise process. Stock prices have multiplicative changes: S_t / S_{t-1}, not additive changes, or $S_t - S_{t-1}$.

** Exercise 12.2: Security issues

Assume the semi-strong form of the efficient market hypothesis is true, but not the strong form.

A. How should recent abnormal stock price changes affect a firm's decision to issue new shares?
B. How should inside information affect a firm's decision to issue new shares?

Part A: Consider the possible implications of abnormal stock price changes if the weak form of the efficient market hypothesis is not true.

Theory #1: Stock prices have momentum. An abnormal stock price increase in period *j* generally leads to abnormal stock price increases in period j+1, j+2, …. If so, an abnormal stock price rise in period *j* suggests the current stock price is under-valued and will rise further in future periods. The firm should wait to issue new shares until the abnormal stock price rises peter out. The stock price will then be at its proper value. If the firm issues new shares while the stock price is still rising, it won't raise the maximum possible amount of capital.

Conversely, if the stock price declined in period *j*, it will probably decline further in future periods. The firm should issue new shares before the stock prices declines further.

Theory #2: Stock prices have intrinsic values, and market prices are randomly distributed about the intrinsic values. An abnormal stock price increase in period *j* means the stock is now over-valued and generally leads to abnormal stock price decreases in period j+1, j+2, …. The firm should issue new shares while the stock price is high, so it can raise the maximum possible amount of capital. If it waits until the stock price reverts to its intrinsic value, it will raise less new capital.

Conversely, if the stock price declined in period *j*, it may be under-value and may increase in future periods. The firm should wait to issue new shares until the stock prices returns to its intrinsic value.

All three forms of the efficient market hypothesis say these two theories are not valid. Stock prices have no momentum, and they have no intrinsic values that differ from their market values. It makes no difference whether recent stock price changes were abnormally high or low. The current market price is the best estimate of the value of the stock.

Part B: If managers have inside information that investor do not have, they have better estimates of future stock price changes than the market has. For example, suppose a firm in a highly competitive industry plans to unveil a new product next month. To avoid competitors' copying the new product, the firm keeps its plans and prototypes secret. (Apple has done this successfully with several new products, such as its iPhone and iPad. When Apple finally unveils the new product, its stock price rises. A year to two after releasing the new product, competitors have similar versions.) If managers have positive inside information, they should wait until the information becomes public and the stock price rises before issuing new shares.

Question: What if manager have negative inside information? For example, managers at Airbus and Boeing had negative inside information that new airplane models were being delayed because of design or production problems. Should firms issue new shares before the information becomes public and the stock price declines?

Answer: Brealey and Myers say that the market expects this, so a secondary stock issue causes (on average) a 3% decline in the stock price, since investors assume that managers have negative inside information. But Brealey and Myers do not recommend this. In the U.S., if a firm issues new shares and then unveils negative information about its prospects and the stock price declines, the firm will be sued for misleading investors.

** Exercise 12.3: Market prices and returns

A. If all investors bought the optimal portfolios of risk-free assets and risky assets (with weights depending on their risk aversion), the average market return would be higher.
B. Firms can earn excess profits by trading stocks of other firms in the same industry, since they have superior information about industry risk.

Part A: Brealey and Myers discuss optimal portfolios. The security market line indicates that all investors should hold a combination of risk-free assets and the market portfolio of risky assets.

Many investors do not hold this optimal portfolio. They hold specific portfolios of high beta or low beta stocks to align the portfolios with their risk aversion. Brealey and Myers say this is sub-optimal. They should hold the market portfolio and use this portfolio in combination with risk-free assets to meet their risk aversion.

But the average market return doesn't depend on which investors hold which stocks. The average stock return is the same; the optimal portfolio strategy makes sure that each investor gets the maximum possible return for a given risk aversion.

Part B: Managers might be able to use inside information about their own firm to achieve excess returns. But insurance company managers do not know any more about the insurance industry than stock analysts who specialize in the stocks of insurers. We may think that actuaries and underwriters know more about insurance than stock analysts. The efficient market hypothesis says this is not true. Were this true, some actuaries and underwriters would become market analysts and make more money.

** Exercise 12.4: Stock and bond market information

Are the statements below true or false?

A. The current stock price reflects past performance, not the likely future performance of the firm.
B. A decline in the yield to maturity of a firm's debt indicates that bankruptcy is more likely.

Part A: The efficient market hypothesis says the opposite is true. The current stock price is the present value (at the appropriate capitalization rate) of the future earnings of the firm. One might also say "of the expected dividends," since the earnings are eventually paid as dividends.

If the stock price declines, analysts expect the firm to have lower future earnings than they expected before, and *vice versa* if the stock price rises.

Part B: A decline in the yield to maturity means the debt is less risky (bankruptcy is less likely). Bankruptcy often reflects unique risk, not systematic risk. Stock returns reflect systematic risk. The yield to maturity on debt reflects the likelihood of bankruptcy, so unique risk is equally important.

The following exercise uses concepts of perfect capital markets and costs of bankruptcy, which are explained the modules on capital structure. The exercise is put here since it focuses on diversification by the firm vs diversification by investors.

** Exercise 12.5: Diversification

- ABC sells Homeowners insurance in California and is exposed to earthquake perils.
- XYZ sells Homeowners insurance in Florida and is exposed to hurricane perils.
- ABC and XYZ each have 10 million shares trading at $30 a share with a capitalization rate of 12%.
- Assume capital markets are perfect, with no costs of bankruptcy.

ABC and XYZ merge to diversify their products, and they have 20 million shares outstanding. The merger has no synergies (no reduction in expenses) and no added expenses; the only effect is diversification.

Which of the following is false?

A. The merger reduces the probability of bankruptcy.
B. The merger reduces the cost of debt capital (the coupon rate on the firm's debt).
C. The share price remains $30.
D. The capitalization rate remains 12%.
E. Risk averse investors are more likely to buy the shares after the merger.

Answer 12.5: E

Statement A: Each insurer is exposed to catastrophes and has a high likelihood of bankruptcy. Hurricanes and earthquakes are unrelated, so the merger reduces the probability of bankruptcy.

Question: The exercise says that the cost of bankruptcy are zero.

Answer: The costs of bankruptcy is not the same as the likelihood of bankruptcy. These costs are legal costs, court costs, costs of losing customers who fear bankruptcy, and similar side costs.

Statement B: If the firm becomes bankrupt, bondholders lose their capital, so they charge a higher coupon rate. A lower likelihood of bankruptcy reduces the coupon rate.

Statements C and D: Hurricanes and earthquakes are unique risks (not systematic risk). Investors hold diversified portfolios, so they are not concerned with unique risks, which are eliminated by diversification.

Statement E: All investors hold the market portfolio. Risk averse investors hold greater percentages or risk-free assets, but their relative holdings of high risk vs low risk stocks is the same as for risk tolerant investors.