Financial Economics II

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Contents

1 Market Efficiency

The notion that stocks already reflect all available information is referred to as the efficient market hypothesis (EMH).

1.1 Versions of the Efficient Market Hypothesis

Weak form Stock prices already reflect all information that can be derived by examining market trading data.

Semi-strong form All publicly available information is reflected in the price.

Strong form All relevant information is reflected in the price.

1.2 Technical Analysis versus Fundamental Analysis

There are two kinds of stock price analysis. Technical analysis relies on the weak form efficiency. According to the weak form hypothesis, stock prices already reflect all information that can be derived by examining market trading data and so in order to predict future prices, analysts use prices and volume information to predict future prices. On the other hand, fundamental analysis relies on the semi strong form efficiency. Since all publicly available information should be reflected in the price, analysts use economic and accounting information to predict stock prices.

1.3 Passive Strategy versus Active Strategy

A passive strategy aims only at establishing a well-diversified portfolio of securities without attempting to find under or overvalued stocks. A good example is index funds, which is a fund designed to replicate the performance of a broad-based index of stocks. As a contrast, active strategy uses security analysis to find out undervalued stocks and sell them in a good timing.

1.4 Event Studies

An event study describes a technique of empirical financial research that enables an observer to assess the impact of a particular event on a firm's stock price.

Let r_t^M denote the market's rate of return during the period and e_t denote the part of a security's return resulting from firm-specific events, respectively.

Then, the stock return, r_t, during a given period t, would be expressed mathematically as:

$$r_t = a + br_t^M + e_t, \tag{1}$$

where the parameter b measures sensitivity to the market return, and a is the average rate of return the stock would realize in a period with a zero market return. Equation (1) gives the decomposition of the return r_t into two parts: the market related part and the firm specific part.

In order to proceed, we re-write the equation (1) in the following way:

$$e_t = r_t - (a + br_t^M). \tag{2}$$

The residual, e_t, is referred to as the abnormal return, which is the return beyond what would be predicted from market movements alone. An event study takes the following steps:

1. By using index model, the parameters a and b are estimated.
2. The information release dates for each firm are recorded.
3. The abnormal returns of each firm surrounding the announcement date are computed.
4. The statistical significance and magnitude of the typical abnormal return is assessed to determine the impact of the newly released information.

Example 1 *Suppose that the analyst has estimated that $a = 0.05\%$ and $b = 0.8$ in (2). When the market goes up by 1%, by (1), the firm's stock should increase by $0.05\% + 0.08 \times 1\% = 0.85\%$. If the stock price actually rises by 2%, then the abnormal return of the day is $2\% - 0.085\% = 1.15\%$.*

2 Are Markets Efficient?

It is not surprising that the efficient market hypothesis does not exactly arouse enthusiasm in the community of professional portfolio managers. The EMH has never been widely accepted on Wall Street. Before we proceed, I will talk about several well-known effects which are said to affect the stock prices.

2.1 The Small-Firm-in-January Effect

Firm size is defined as the total value of outstanding equity. Banz pointed out that average annual returns are consistently higher on the small-firm portfolios. The difference in average annual return between portfolio with the largest firms and with the smallest firms is 8.59 %. Later studies showed that the small-firm effect occurs virtually entirely in January, in fact, in the first 2 weeks of January. The size effect is in fact a "small-firm-in-January" effect.

One of the possible explanation for this effect is tax. The hypothesis is that many people sell stocks that have declined in price during the previous months to realize their capital losses before the end of the tax year. Such investors do not put the proceeds from these sales back into the stock market until after the turn of the year. Therefore, in January the rush of demand for stock places an upward pressure on prices. This results in the January effect.

It is said that the January effect is larger for the smallest firms. The small-firm group includes stocks with the greatest variability of prices during the year. Thus, the group includes a relatively large number of firms.

Yet, this theory is not satisfying. First, if the positive January effect is a result from buying pressure, then a selling pressure in December should cause a symmetric negative effect on stock prices. Also, if the investors know that the January effect occurs, and then they should buy small-firm stocks in December, which should wash up the January effect in December.

2.2 Book-to-Market Ratios

Fama and French showed that a powerful predictor of returns across securities is the ratio of the book value of the firm's equity to the market value of equity, which is called "book-to-market ratio." They classified firms into 10 groups according to book-to-market ratios and examined the average monthly rate of return of each of the 10 groups during the period of July 1963 through December 1990. They found that the highest group had an average monthly return of 1.65 %, while the lowest group had only 0.72 %. The dependence of returns on book-to-market ratio is independent of beta.

They also found that after controlling for the size and book-to-market effects, beta seems to have no power to explain average security returns. This finding is an important challenge to the notion of rational markets. If all information available is already reflected into stock prices, sizes or book-to-market ratio would not matter for stock prices. But they seem to be good proxy for stock prices.

3 Empirical Evidence on Security Returns

3.1 Tests of the Single-Factor Model

we will carry out a first-pass regression equation:

$$r_i - r_f = a_i + b_i(r_M - r_f) + e_i, \tag{3}$$

where

- $r_i - r_f$: difference between the return for an individual stock and risk free asset's return;
- $r_M - r_f$: difference between the return for market portfolio and risk free asset's return.

First, we estimate a_i and b_i. By using these estimates, we carry out a second-pass regression:

$$\overline{r_i - r_f} = \gamma_0 + \gamma_1 b_i. \tag{4}$$

Comparing (3) and (4), we can conclude that if the CAPM is valid, then γ_0 and γ_1 should satisfy:

$$\gamma_0 = 0 \text{ and } \gamma_1 = \overline{r_M - r_f}.$$

But this regression usually is rejected. Does this mean the CAPM is not valid?

3.2 Roll's Criticism

As Richard Roll pointed out, there is a single testable hypthesis associated with the CAPM is: the market portfolio is mean-variance efficient. All the other implications of the model, for example the best-known being the linear relation between expected return and beta, follows from the market portfolio's efficiency. There are two difficulties in using a proxy such as the S&P500 for the market portfolios. First, a proxy might be efficient, while the true market is not. Or vice versa. Second, most reasonable proxies should be highly correlated with the true market portfolio. The use of different proxies can lead to quite different conclusions. This problem is referred to as benchmark errors. It refers to the use of an incorrect benchmark (market proxy) portfolio in the tests of the theory.

Roll's critique tells us that CAPM tests are handicapped from the outset. But is that all the problem here? Going back to a first-pass and second-pass regression, we know that if a first-pass estimation includes the error in the estimated beta, then this error will be brought to a second-pass estimation. This statistical problem is called "measurement error in beta." Test results could result from measurement error.

3.3 Jaganathan and Wang Study

We should remember two important deficiencies of the tests of the single-factor models. First, there is only small fraction of the value of assets traded in capital markets. The most important non-traded capital is human capital, probably. Second, there is ample evidence that asset betas are cyclical and that accounting for this cyclicality may improve the predictive power of the CAPM.

Jaganathan and Wang (JW) considered the effects of change in the value of human capital based on the rate of changes in aggregate labor income, and growth of labor income. Moreover, they considered the possibility that business cycles affect assets asset betas. As Table 13.2 shows, their results are far more supportive of the CAPM than earlier tests.

3.4 Chen, Roll and Ross Study

The multifactor CAPM is elegant theory of how exposure to systematic risk factors should influence expected returns. But they provide little guidance about which sources of risk ought to result in risk premiums. Chen, Roll, and Ross identify several possible variables that might proxy for systematic factors. Then, they show that it may be possible to hedge some economic factors that affect future consumption risk with appropriate portfolios.

3.5 Fama French Three Factor Model

The multifactor model that occupies center stage these days is the three-factor model introduced by Fama and French. The systematic factors in the Fama-French model are firm size and book-to-market ratio as well as the market index.

They classified firms into 6 groups according to firm size and book-to-market ratio. Namely, group S and B with respect to firm size (market capitalization). Also, group L, group M, and group H with respect to book-to-market ratio. Then, SMB (for small minus big) is calculated from the monthly returns of the six portfolio as:

$$SMB = 1/3(S/L + S/M + S/H) - 1/3(B/L + B/M + B/H). \tag{5}$$

Similarly, the monthly value of HML (for high minus low ratio) is calculated as:

$$HML = 1/2(S/H + B/H) - 1/2(S/L + B/L). \tag{6}$$

Finally, they carried out the following regression:

$$r_i - r_f = a_i + b_i(r_M - r_f) + s_i SMB + h_i HML + e_i. \tag{7}$$

As Table 13.5 shows, return are explained by size, book-to-market ratio and beta.

3.6 Time-Varying Volatility

Now, we turn our attention to the volatility of return. We may associate the variance of the rate of return on the stock with the rate of arrival of new information because new information may lead investors to revise their assessment of intrinsic value of the asset. The rate of arrival of new information is time varying. Consequently, we should expect the variances of the rates of return on stocks to be time varying.

Engle proposed a model ARCH (autoregressive conditional heteroskedasticity) which is based on the idea that a natural way to update a variance forecast is to average it with the most recent squared surprise (i.r. the squared deviation of the rate of return from its mean). Today, the most widely used model to estimate the time-varying variance of stocks and stock-index returns is the generalized autoregressive conditional heteroskedasticity (GARCH). The model is summarized into the following equation:

$$\sigma_t^2 = a_0 + a_1 \epsilon_{t-1}^2 + a_2 \sigma_{t-1}^2, \tag{8}$$

where σ_t is the updated forecast of variance, ϵ_{t-1}^2 is the most recent squared prediction error in market return, and σ_{t-1}^2 is the most recent variance forecast. As Figure 13.4 shows, ARCH-type model clearly capture much of the variation in stock market volatility.

3.7 Equity Premium

Most popular definition of equity premium should be the excess returns earned on equity portfolios over the risk-free rate. Mehra and Prescott examined the equity premium and found that the historical-average excess return has been too large to be consistent with reasonable levels of risk aversion. In other words, it appears that the reward investors have received from bearing risk has bee so generous that it is hard to reconcile with rational security pricing. This is called “Equity Premium Puzzle.”

Fama and French provided a possible explanation for the puzzle. As the data shows, the equity premium puzzle seems to emerge more recently. The data shows that markets with long histories typically have higher returns. This is called “survivorship bias.”