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CORPORATE FINANCE AND INVESTMENT

Decisions and strategies

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key factors reduced to one measure of default risk and the RPI. Again, there was much intercorrelation among variables, but the return on the stock market index, although included in the initial tests, appeared in none of these final lists.

Once the main factors influencing share returns are established, there remain the problems of estimating risk premiums for each factor and measuring the sensitivity of individual share returns to these factors. For this reason, the APT is currently only in the prototype stage and yet to be accepted by practitioners.

9.16 FAMA AND FRENCH'S THREE-FACTOR MODEL

An approach that marries the APT to the multi-factor approach is the three-factor model developed in a series of papers by Fama and French (1993, 1995, 1996). This has the distinctive merit of an empirical grounding, being based on their paper of 1992. In Section 9.13, we noted that they found that US stock returns were explained better by company size and by the ratio of book value of equity to market value than merely by movements in the return on the whole market, magnified or moderated by Beta, as in the CAPM.

These two additional explanatory variables are utilised in the three-factor model. It states that stock returns above the risk-free rate (i.e. the equity premium) are determined by:

- The risk premium on the market portfolio.
- The difference between the return on a portfolio of small company shares and the return on a portfolio of large company shares (small less big, or SLB).
- The difference between the return on a portfolio of high book-to-market value stocks and the return on a portfolio of low book-to-market value stocks (high less low, or HLL).

The three-factor equation can be written thus:

$$\text{Expected return on stock}_j = \text{ER}_j = R_f + \text{Risk premium} = R_f + [\text{Beta}_1(\text{ER}_m - R_f) + \text{Beta}_2(\text{SLB}) + \text{Beta}_3(\text{HLL})]$$

The logic behind the formulation of the model is that the average small company and its stock is assumed to be more risky than the average large firm and its stock and thus commands a higher risk premium. Larger firms are generally more stable as they are more diversified by products and markets, and have better credit ratings, partly because their stock of assets is larger. Similarly, a stock with a high book value relative to market value is assumed to be more risky than one with a low book value relative to market value. The former owes its higher valuation rating to a greater growth potential and/or greater endowment of intangible assets such as intellectual capital.

To make the model operational, information is required on the risk premiums related to each factor, and for the various Beta factors. For example, imagine that empirical evidence suggests that, in past years, the risk premium on the market portfolio has averaged 5 per cent, the risk premium for a small company stock compared to a larger firm has averaged 6 per cent, and the risk premium for the stock of a typical firm with a high book-to-market value compared to market price has averaged 4 per cent.

When the risk-free rate is 3 per cent, for a firm of average risk, i.e. average sensitivity to each of these three factors, and thus with Beta values of 1.0 across the board, the overall expected return will be:

$$\text{ER}_j = 3\% + [(1.0 \times 5\%) + (1.0 \times 6\%) + (1.0 \times 4\%)] = 3\% + 15\% = 18\%$$

In practice, firms exhibit varying sensitivities to these factors depending on their product and market profiles, for example, and thus carry Beta values different from one. Assume that Firm X has a low sensitivity to market movements (Beta = 0.4), a relatively high sensitivity in respect of relative size (Beta = 1.2) and a relatively low sensitivity to the book versus market value factor (Beta = 0.8), then its expected return is:

$$ER_j = 3\% + [(0.4 \times 5\%) + (1.2 \times 6\%) + (0.8 \times 4\%)] = 3\% + 12.4\% = 15.4\%$$

There has been extensive research in recent years based on Fama and French's highly influential approach. Most studies reinforce the view that Beta alone cannot adequately explain stock market returns, although they do not always agree on the most powerful determinants. In the process of analysis, a number of anomalies that the Fama and French model is unable to explain have emerged, for example, a negative relationship between returns and growth in assets, which appears counter-intuitive – why do firms invest in new projects if the returns are persistently negative? Among the most recent claimants to have developed a better 'three-factor model' is the model developed by Chen and Zhang (2010). This appears to account for many such anomalies and gives a good explanation of stock returns over a lengthy period as well as recording a non-significant alpha coefficient. Even so, their model does include the sensitivity of stock returns to the market excess returns (i.e. Beta as in the CAPM), as the first factor. The others are: the difference between the returns on a portfolio of low-investment stocks, and the returns on a portfolio of high-investment stocks; and the difference between the returns on a portfolio of stocks with high returns on assets, and the returns on a portfolio with low returns on assets. No doubt, such work will continue.

9.17 THE FOUR- AND FIVE-FACTOR MODELS

In addition to several other earlier studies, the findings of Fama and French (1992, 1993, 1995, 1996) persuaded several researchers in this area to construct and empirically investigate factor models. First, Carhart (1997) presented a four-factor model that added momentum to the Fama and French (1993) three-factor model. The author regards the four-factor model as a model of market equilibrium and find the evidence which is consistent with market efficiency, and that explains the role of size, book-to-market ratio and momentum factors. In another study, Fama and French (2006b) explained the CAPM anomalies by linking it to the dividend discount model. They found no clear evidence to support of the role of earnings and growth in assets, as predictors of stock returns.

Fama and French (2015) added operating income and growth in firms' assets as the two additional factors to their three-factor model and then tested the explanatory power of their new five-factor model. Their findings support the theoretical underpinning of their five-factor model and present the evidence suggesting that performance of their five-factor model is robust to the way its factors are constructed. Fama and French (2017) tested their five-factor model with data from four different regions, including America, Europe, Asia and Japan. The authors argued that their five-factor model generally provides the strongest evidence about all metrics across all regions, and they support the use of their five-factor model over and above the three and four factor models.

In the UK context, Racicot and Rentz (2016) re-tested the Fama and French five-factor model by using a more robust qualitative analysis with UK data. They found favourable evidence only for the market factor, whereas the rest of the factors were identified as insignificant in predicting stock returns in the United Kingdom. Similarly, in addition to the application of a more robust analysis, Racicot and Rentz (2017) added liquidity as the sixth factor to the FF's five-factor model, and again found the

evidence suggesting that only the market factor is significantly associated with UK stock returns. For all other factors, including liquidity, no significant relationship was found with UK stock returns.

9.18 ISSUES RAISED BY THE CAPM: SOME FOOD FOR MANAGERIAL THOUGHT

The CAPM raises a number of important issues, which have fundamental implications for the applicability of the model itself and the role of diversification in the armoury of corporate strategic weapons.

Should we trust the market?

Legally, managers are charged with the duty of acting in the best interests of shareholders, i.e. maximising their wealth (although company law does not express it *quite* like this). This involves investing in all projects offering returns above the shareholders' opportunity cost of capital. The CAPM provides a way of assessing the rate of return required by shareholders from their investments, albeit based partly on past returns. If the Beta is known and a view is taken on the future returns on the market, then the apparently required return follows. This becomes the cut-off rate for new investment projects, at least for those of similar systematic risk to existing activities. This implies that managers' expectations coincide with those of shareholders or, more generally, with those of the market. If, however, the market as a whole expects a higher return from the market portfolio, some projects deemed acceptable to managers may not be worthwhile for shareholders.

The subsequent fall in share price would provide the mechanism whereby the market communicates to managers that the discount rate applied was too low. The CAPM relies on efficiently set market prices to reveal to managers the 'correct' hurdle rate and any mistakes caused by misreading the market. The implication that one can trust the market to arrive at correct prices, and hence required rates of return, is problematic for many practising managers, who are prone to believe that the market incorrectly values the companies that they operate. Managers who doubt the validity of the EMH are unlikely to accept a CAPM-derived discount rate.

Should companies diversify?

The CAPM is based on the premise that rational shareholders form efficiently diversified portfolios, realising that the market will reward them only for bearing market-related risk. The benefits of diversification can easily be obtained by portfolio formation, i.e. buying securities at relatively low dealing fees. The implication of this is that *corporate diversification is perhaps pointless as a device to reduce risk because companies are seeking to achieve what shareholders can do themselves, probably more efficiently*. Securities are far more divisible than investment projects and can be traded much more quickly when conditions alter. So why do managers diversify company activities?

An obvious explanation is that managers have not understood the message of the EMH/CAPM, or doubt its validity, believing instead that shareholders' best interests are enhanced by reduction of the total variability of the firm's earnings. For some shareholders, this may indeed be the case, as a large proportion of those investing directly on the stock market hold undiversified portfolios.

Many small shareholders were attracted to equity investment by privatisation issues or by Personal Equity Plans and their successor, ISAs (Individual Savings

Accounts). Larger shareholders sometimes tie up major portions of their capital in a single company in order to take, or retain, an active part in its management. In such cases, market risk, based on the co-variability of the return on a company's shares with that on the market portfolio, is an inadequate measure of risk. The appropriate measure of risk for capital budgeting decisions probably lies somewhere between total risk, based on the variance, or standard deviation, of a project's returns, and market risk, depending on the degree of diversification of shareholders.

A more subtle explanation of why managers diversify is the divorce of ownership and control. Managers who are relatively free from the threat of shareholder interference in company operations may pursue their personal interests above those of shareholders. If an inadequate contract has been written between the manager–agents and the shareholder–principals, managers may be inclined to promote their own job security. This is understandable, since shareholders are highly mobile between alternative security holdings, but managerial mobility is often low. *To managers, the distinction between systematic risk and specific risk may be relatively insignificant, since they have a vested interest in minimising total risk in order to increase their job security*. If the company flounders, it is of little comfort for them to know that their personal catastrophe has only a minimal effect on well-diversified shareholders.

As we will see in Chapter 20, there are many motives for diversification beyond merely reducing risk. However, it is common to justify diversification to shareholders purely on these grounds, at least under certain types of market imperfection. When a company fails, there are liquidation costs to bear as well as the losses entailed in selling assets at 'knock-down' prices. These costs may result in both creditors and shareholders failing to receive full economic value in the asset disposal. Although this will not devastate a well-diversified shareholder, the resulting hole in his or her portfolio will require filling in order to restore balance. Company diversification may reduce these risks and also the costs of portfolio disruption and readjustment.

The conglomerate discount

Conglomerate companies are made up of businesses that operate in different industry or business sectors. Therefore, conglomerate companies are, by definition, diversified. The value of conglomerates is typically less than the value that would be assigned to the different parts of the business if they were operating separately from one another. Consequently, in stock markets there is often talk of a 'conglomerate discount' applying to the shares, and this is illustrated in the examples below of Akzo and Sony.

Akzo faces tough battle after fending off PPG

After vanquishing the enemy, Akzo Nobel now faces more battles on other fronts. The Dutch paintmaker's resistance to a three-month takeover assault finally succeeded last week, when its US rival PPG Industries gave up its pursuit of a €26.9bn deal that would have created an industry leader.

But Akzo's victory may yet be pyrrhic. Chief executive Ton Büchner faces the considerable tasks of splitting the company into two and achieving increased financial targets that were promised as part of the defence. At the same time, he must repair strained relationships with a number of investors who were angered by the Amsterdam-based group's handling of the episode.

The immediate task at hand is to win back the support of several large shareholders, who publicly criticised Akzo over its refusal to enter negotiations with its suitor.

But for its part, Akzo has acknowledged some mistakes. 'We highly value shareholder perspectives and regret that a number of shareholders believe we have

insufficiently explained our considerations in respect of PPG's proposals,' said Mr Büchner. 'We will be seeking and listening to feedback with an aim to improving these important relationships.'

One area where investors will be expecting early signs of progress is the planned separation of Akzo's speciality chemicals business, which makes everything from table salt to bleaching agents on an annual revenue of €4.8bn. A 'dual-track' process is under way whereby the business could either be sold or spun off as a discrete listed entity. Akzo expects to complete this process within a year, and if the company opts for a sale of the business the resulting cash is expected to be returned to investors. The planned separation of the speciality chemicals unit will leave Akzo focused on paints and coatings, and analysts say the company's share price could therefore shed its current *'conglomerate' discount*.

However, Akzo's management will be under pressure to create value at least commensurate with the level of PPG's bid. Its third and final stock-and-cash offer valued Akzo's shares at €96.75 each — a premium of 50 per cent to the undisturbed price. The stock closed at €75.75 on Friday. Akzo management responded to PPG's pursuit with a bumper shareholder payout, including a special dividend, of €1.6bn this year. It has also set higher financial targets.

Sony: ghosts in the machine

The chief executive of Sony is seeking kudos as a ghost-buster by promising to lift operating profits above ¥500bn ($4.4bn) this financial year. Weak profitability has haunted the Japanese electronics and media group for a decade. But investors should beware a spectre Mr Hirai cannot dispel: Sony's conglomerate status.

The company's interests range from silicon chips and consumer electronics to a US movie studio whose remake of Ghostbusters flopped in 2016. Sony's full-year results, released after market close on Friday, made for poor viewing too. A $962m impairment for Sony Pictures contributed to a 17.4 per cent drop in profits before tax, to ¥251.6bn. But the shares popped 3 per cent on Monday, in response to plans for a financial sequel with greater appeal.

The 73 per cent uplift to operating profits envisaged this year would take operating margins to about 6.25 per cent. Erstwhile chief executive Howard Stringer only beat the 5 per cent hurdle once in seven years. On that basis, the return on common equity of the group could be expected to come in at about 11 per cent, beating a 10 per cent target.

There is scope for Sony to do even better. The ¥500bn forecast includes a ¥40bn cushion for group cost overruns that may not be needed. Mr Hirai has reined in costs and risked the wrath of traditionalists by ditching Sony's Vaio laptop and PC business in 2014. As a result, the shares have handsomely outperformed the QE-fattened Topix index over three years. His rosy short-term forecast would look more durable if it did not depend on better trading from movies and chips. The first business is hit-and-miss. The second is highly cyclical.

Mr Hirai is splitting Sony into distinct subsidiaries to dispel an illusion common within large diversified groups that profitability is a collective responsibility with no individual comeback. However, the group will suffer from a *conglomerate discount* so long as its activities remain so widely spread. The shares are rated in line with Panasonic rather than Nintendo. A full break-up is unlikely. However, Mr Hirai might at least vacuum up and expel some more troublesome little spooks in the mould of Vaio. The underperforming components division would be a good place to start.

Self-assessment activity 9.11

What reasons may there be for a conglomerate discount existing?

(Answer in Appendix A)

SUMMARY

We have examined the nature of the risks affecting the holders of securities and have begun to discuss whether the return required by shareholders, as implied by market valuations, can be used as a cut-off rate for new investment projects.

Key points

- Security risk can be split into two components: risk specific to the company in question, and the variability in return due to general market movements.
- Rational investors form well-diversified portfolios to eliminate specific risk.
- The most efficient portfolio of risky securities is the market portfolio, although investors may mix this with investment in the risk-free asset in order to achieve more preferred risk–return combinations along the capital market line.
- The risk premium built into the required return on securities reflects a reward for systematic risk only.
- The risk premium on a particular share depends on the risk premium on the overall market and the extent to which the return on the security moves with that of the whole market, as indicated by its Beta coefficient.
- This premium for risk is the second term in the equation for the security market line:

$$\mathrm{ER}_j = R_\mathrm{f} + \beta_j(\mathrm{ER}_\mathrm{m} - R_\mathrm{f}).$$

- Practical problems in using the CAPM centre on measurement of Beta, specification of the risk-free asset and measurement of the market's risk premium.
- In an all-equity-financed company, the return required by shareholders can be used as a cut-off rate for new investment if the new project has systematic risk similar to the company's other activities.
- There is some debate about whether managers should diversify company activities merely in order to lower risk.
- Empirical studies seem to throw increasing doubt on the CAPM.
- The main proposed alternative, the Arbitrage Pricing Theory (APT), relies on fewer restrictive assumptions but is still in the prototype stage.

Further reading

Because this a wide and rapidly moving field, we give more than our customary commentary on some of these references in order to provide more context.

Copeland *et al.* (2013) offer a rigorous treatment of the derivation of the formulae used in this chapter. Brealey *et al.* (2013) offer an alternative, less mathematical treatment. You should also read the famous critique of the CAPM by Roll (1977). Fama and French (1992), although a difficult paper, is essential reading for obtaining an in-depth understanding of these issues. In the UK context, Strong and Xu (1997) have attempted to replicate the original Fama and French paper.

An excellent text on Modern Portfolio Theory is Elton *et al.* (2014), covering the basic theory and including an up-to-date survey of empirical work. There is a very good resumé of the Fama and French analysis in Ross *et al.* (2015). Meanwhile, all these arguments have not gone unchallenged – see, for example, the two articles by Black (1993a, 1993b) and that by Shanken *et al.* (1995).

Fama and French (1995, 2002) have updated their earlier work, reaching essentially similar conclusions. Fama and French (2002) has also entered the debate on the equity premium, whereas Fama and French (2006b) explained the CAPM anomalies by linking it to the dividend discount model but found no clear evidence about the role of earnings and growth in assets in predicting of stock returns. Chen and Zhang (2010) have staked a claim to a 'better' three-factor model. More recently, Fama and French (2015) added operating income and growth in firms' assets as two additional factors to their three-factor model and then tested the explanatory power of their new five-factor model. Similarly, Fama and French (2017) test their five-factor model with data from four different regions, including America, Europe, Asia and Japan. Racicot and Rentz (2016) re-tested this five-factor model with UK data and found favourable evidence only for the market factor. Similarly, Racicot and Rentz (2017) added liquidity to the five-factor model but found only the market factor as significantly associated with UK stock returns.