CHAPTER 4

Marris Hypothesis

"Mark and learn, Amy. Mark and learn."
Charles Dickens

In the long terms, stock investment is all about dividends; the value of a portfolio should correspond closely to the present value of dividends. If shareholders really needs cash, they can sell equity. Many companies are sitting on cash and do not want to invest until they have clear vision of the game. In low-interest environments, investors' demand for dividend-paying stocks will be strong. However, we should look at the company's fundamentals, especially if management signal that a profit warning falls below analysts' expectations. But are dividends the best way for companies to use their excess cash? Do dividends matter?

If a company pays out cash, that cash is no longer on its balance sheet. The book value of the company — its assets minus its liabilities — reduces by that amount it has paid out. Cash belongs to shareholders whether it is on the balance sheet or paid out in dividend cheques. A high dividend yield, like a low price/earnings ratio, is a signal that the market is undervaluing a stock. So what if dividends are a signal? A natural question that arises is whether dividend signals at different times in a game contribute equally to the equity risk premium.

Why Marris?

To understand this is to understand the indifference relationship embedded within the Marris hypothesis — a downward-sloping relationship between dividend growth and R&D expenditure. An important element of the Marris hypothesis is that the portfolio of growth firms has cash flows that are more front-loaded than the cash flows of the portfolio of value firms.

Dividends are assumed to have a predictable component in financial modelling, but the signalling of unexpected dividends growth creates a shock for Bayesian shareholders that may be negatively correlated with the Marris v ratio. Bayesians tend to panic and sell their equity believing that more dividends today signals less growth potential tomorrow. A PLT signal translates a negative dividend shock into a higher expected growth rate in t+1. PLT is about reassuring shareholders that no unnecessary risks are being taken. It is about keeping 'the show on the road' during a game.

Companies need to raise capital to develop new products and invest in research and development (R&D). The market value of a company is dependent on the underlying growth potential as measured by investment in product diversification. The Marris model offers an opportunity to chart a measure of profitability defined in terms of gross profit margin and capital turnover ratio. The measure can be captured by the equation gd = gc = α*p, known as the **balanced growth path** (BGP) or valuation curve. One can observe guidance on profit margins filtering into profitability as an incumbent player competes against other incumbents and new entrants. Lower than forecast margins disappoint the market investors but also signal a degree of competition in the market. Financial markets adjust to every piece of information, and signalling quickly adjusts share prices to a fair value. Later in this chapter we explore how the BGP concept can be used to determine whether a company's share price at time period t is the best estimate of its true value. Part of the rationale for Framework Tn=3 is an attempt to find a pattern in observed behaviours and phenomena using management type and time as two key determinants.

However, the competition in the product market, which determines market share performance, can be defined in terms of Tn=3 under the umbrella of Edgeworth's (Chapter 1) strategic complements on price — aggressive price matching — or in terms of strategic substitutes across the market shares. We address these issues later in this chapter. In the interim, suffice it to say that strategic substitutes may be captured by the zero-sum constraint, where a player gains market share at the expense of a competitor. The key point here is that if capital is raised to fund growth, for example, via product diversification, then the expectations of consumers regarding the product's bells and whistles will constrain the growth target if the product's technology lags behind the time-dependent preferences of the consumers. If a player can sell large volumes, it should help support the profit margin. Increased competition, for example, is a significant factor behind a decline in profit margin, particularly when the player is unable to differentiate fast enough in the market.

Our focus in this chapter is on the Marris model. The 1966 formulation has become "the standard one for analysis of [the growth of]

the managerially controlled firm" (Hay and Morris, 1991). In his model, Marris presented the hypothesis that managerial control would lead to growth as an objective, showing that shareholders were a less important constraint on such firms than financial markets. The Marris model is dynamic in the sense that it incorporates growth. Like Baumol's model, it assumes that management will act to maximise their utilities rather than profits, but in contrast to Baumol, it assumes that this will be achieved through growth rather than sales.

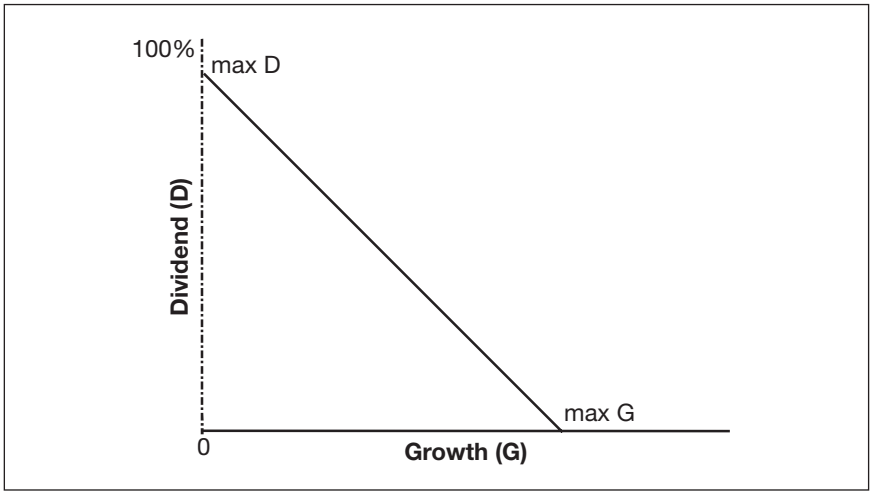
We have selected this model because it represents one of the few explicit analyses of firm growth and because it has a greater relevance today than ever before as management signal to maintain performance. More important, many companies today have too much cash on their books. Should they return cash to shareholders or investment? For example, both Apple Inc and Pfizer Inc have excess cash today, but do they have the investment potential in new products to secure long-term growth in time period $t+1$? By revisiting the mechanics of the Marris model 40 years later, we are able to present a signalling option that fits within the parameters of Framework $Tn=3$ and may offer management a cash cure. The simplifying assumption of a balanced growth path as the concave function in Figure 4.2 allows management to formulate a long-run equilibrium growth model in which the firm's rate of demand-side growth must balance its rate of supply-side growth, and in which explicit economic factors can be identified that influence both sides.

Dividends versus R&D Trade-off

Abstracting from the literature on the Marris model, there is a consensus that Marris proposed a model of key metrics of firm performance, including sales growth and profitability. Sales growth depends on the success of R&D expenditure in achieving product diversification. But management are faced with an interesting trade-off, as illustrated in Figure 4.1: to invest more in R&D or return cash to shareholder investors. We call this the dividends paradox. It is discussed in further detail on page 57.

Figure 4.1 shows that there is a trade-off between the proportion of profit paid out by the firm and how much it can grow — every

Figure 4.1
R&D Trade-off



time the firm reduces the dividend proportion by moving down the vertical axis, it can finance extra growth. The key issue for shareholders is whether or not the investment being financed by paying out less in current dividends eventually produces more profits and future dividends. Shareholders have to trust management on this.

The *gd* Equation

Where does a firm obtain its g_C supply of capital? Within the finance literature there are two sources, debt or equity. Contrary to the emerging theory at the time on the relevance of debt financing versus equity financing to the value of the company, Marris promoted minimal debt. Once equity capital has been injected into the company, it can be used for R&D expenditure and/or returning dividends to equity investors. So g_D, the demand for capital, has two sources, an internal management demand for more R&D expenditure and an external shareholder demand for more cash through dividends. There is a trade-off. The Marris trade-off can be summarised by the Koeller-Lechler equation:

$$g_D = g_C = \alpha^* p$$

The equation uniquely determines the firm's equilibrium growth rate and the rate of return on its capital (p). According to standard accounting principles, the term p in Marris' model is influenced by the firm's capital (asset) turnover ratio, measured as output/capital. This ratio is an indicator of the operating effectiveness of the firm — the extent to which the firm's asset base has been used to generate sales. Relative ineffectiveness of the firm's sales efforts would result in a lower rate of return on capital, p, and a reduced growth rate.

Furthermore, the term p is also influenced by the profit margin on sales, measured as profit/output, which can be interpreted as an indicator of the firm's operating efficiency. We can rewrite the gd equation as follows:

$$\{\text{profit/output}\} \times \{\text{output/capital}\} = \{\text{profit/capital}\} = \text{profitability} = p$$

Relative inefficiency of the firm's operations (expenses increase relative to sales) would result in a lower value for p. The presence of bounded rationality, for example, or the Penrose effect, though not specified as such by Marris, could result in inward shifts of the balanced growth path.

The firm's demand-side growth rate (g_D) is determined by the extent of product development. The extent of product development is then related to the firm's goal of increasing its profit rate. The achievement of this goal depends on the firm's managerial capacity to successfully promote product development. According to Marris, demand-side product development efforts should eventually lower the firm's rate of return on capital if one assumes diminishing returns to product development activities. Improvement of the firm's managerial capacity can be expected to moderate the demand-side trade-off between growth and profitability. The supply-side growth rate (g_C) of the firm's capital base is dependent on the extent of internal financing from profits, where the parameter α^* reflects the maximum extent of new investment that can be financed per unit of profitability. The value

of α^* is determined by shareholders' interests in avoiding low profits and possible takeover.

The Dividends Paradox

Within the Marris model, management are faced with a trade-off between R&D expenditure and payment of dividends. Management do not wish to cease growing and so retain an increasing proportion of profits in time period t to finance increased growth in time period t+1. What happens when growth is curtailed? For example, this could arise in some product markets wherein the company is unable to differentiate quickly enough. To sustain the market value of the company, should management pay dividends or retain more modest profits? Scouller argues that management can enjoy fast growth while also benefiting shareholders; their retained cash is being spent better than if they invested it elsewhere. However, on account of management concern with their own security from takeover, they would be unlikely to push their activity so far as to dilute the market value of their own shares sufficiently to create a reverse risk of their own takeover. Eventually the new markets saturate, and unless other similarly profitable markets are found, the firm becomes mature and value peaks. However, within Framework Tn=3 dividends are regarded as signals and the payment of dividends can influence the share price. If the dividends signal is interpreted as lack of product innovation within the g_D side of the equation, then management have to engage in positive learning transfer (PLT) by communicating with shareholders that in time period t+1 value will be restored. The share value to one investor may signal the company's ability to pay dividends, but the payment of dividends signals to another investor an absence of R&D and innovation. Therefore PLT is one way to ensure that share prices reflect the execution of strategy.

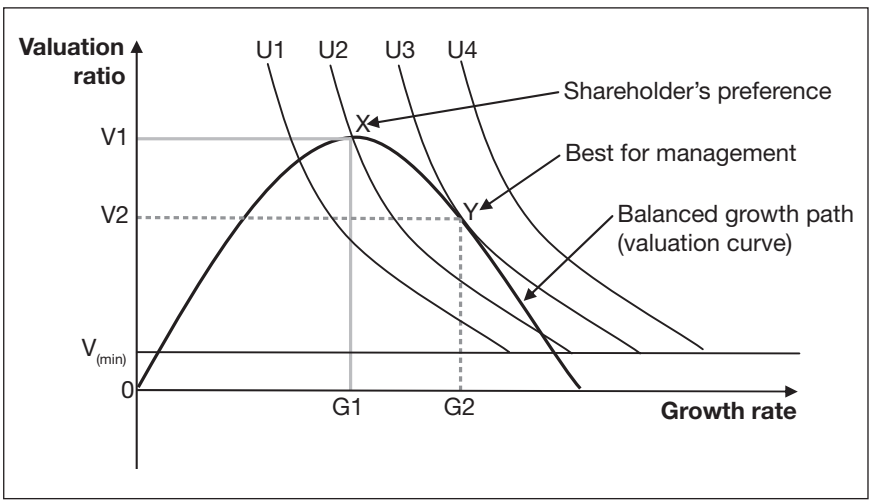
Marris Balanced Growth Path

In Figure 4.2, rather than at a point x where the valuation would be maximised, management choose to situate the firm at a point y where,

under certain constraints, the growth rate is maximised. Marris represented his classic trade-off outcome by plotting the profit rate p versus the growth rate g. Alternatively, in Figure 4.2, we have plotted the firm's 'valuation ratio' — the name given by Marris to the ratio of market value to underlying asset value, subsequently named q by Tobin — and growth rate. It allows for an interesting trade-off: management may pursue a faster growth rate at the price of reducing the valuation ratio to below its maximum. Note that a robust empirical relationship between low valuation ratio and statistically observed probability of takeover was identified by Bartley and Boardman in 1986.

The Marris model is also of interest because it focuses on the vulnerability of a firm to agency costs. The valuation ratio V is used to identify the best growth rate that is acceptable to both the shareholders and management. U1 to U4 are management indifference curves. They represent the third or Z variable. In the classic Marris model, the third variable is managerial satisfaction or utility. U4 provides the highest utility to management. However, because U4 is beyond the balanced growth path (BGP), it is unachievable. Moving to the left to U3 generates a tangency point Y on U3, which is tangent to the BGP. It provides the

Figure 4.2
Marris' Trade-off



highest possible utility to management. However, point x on U2 provides the best return to shareholders because of a higher valuation ratio. In choosing between these two points, management have a bias to set G2 as their ultimate organisational objective. The difference (V_2–V_1) is a measure of agency costs; they can be minimised by PLT.

Quasi-Marris Model 21st Century

In his original model, Marris advocated that corporate growth could be manipulated to maintain an optimum dividend-to-profit retention ratio that keeps the shareholders satisfied but does not retain too high a level of profit, creating a cash-rich business ripe for a takeover. This implies a degree of control on share value that would seem difficult to sustain for even the most effective management team. There are simply too many other factors that could affect the valuation ratio of the business beyond corporate growth. Deciding on how best to achieve growth becomes a crucial issue for management during the life cycle of a firm.

For example, if management wish to grow by product diversification there is a constraint inherent in the Marris model, the *gd* equation, that is fairly acute for firms that opt to grow through product diversification rather than by acquisition:

$$gd = f.(d, k)$$
$$\text{growth} = f.(\text{retained profits})$$

where d is the dividend rate as a signal and the parameter k represents the percentage of successful new products. The k parameter ultimately depends on R&D, advertising and promotion; and the spend on these variables depends on the profits, which ultimately depends on the efficiency of the firm.

A Marris type would seek to achieve organic growth through product diversification by investing more in R&D and paying lesser dividends to shareholders. There will be a trade-off between these two variables, and therefore, we have defined the trade-off variables to be the R&D expenditure and dividends. The third variable is the valuation as measured by

$$\text{Marris v} = \text{market value/asset value} = \text{Tobin's q}$$

As asset value (net book value) grows with R&D investment in *gd* and more shareholders invest in the company on the strength of the PLT, the v increases and performance as measured by increases in profitability.

The Marris v

The Marris v is an important variable. It is not unrelated to Tobin's q. If $q = v < 1$, then the assets are not fully utilised in the company and it would be a good investment to buy shares when $v < 1$. The buying of shares would increase the share price and the market value in time period $t+1$. There are many financial performance ratios, such as the Hamada equations, Sharpe ratio, Jensen alpha, Traynor ratio and Sortino ratio, in addition to α and β of the capital asset pricing model. They represent a measure of financial elasticity by measuring financial performance. The Marris v does likewise, measuring the elasticity of asset value to market value but defined in terms of management type to ensure that growth (*gd*) determines value (v). The Marris security parameter, a, is a combination of a range of key financial indicators (KFIs), such as leverage ratio, liquidity ratio and retention ratio. Fundamentally, management are secure if the firm carries minimal debt, delays dividends in time period t in favour of R&D in time period $t+1$, and engages in positive learning transfer to reassure investors.

Changes to the availability of information and mismatch in the financial signals make it more difficult to beat the market consistently by observing patterns and actively investing in equities. Data mining and access to large databanks have facilitated access to real-time data, but the embedded patterns contain nuggets of information that have to be decoded. Investors often overlook the patterns or fail to recognise the significance of the signals in a game.

The Marris v ratio acts as a buffer when deciding when to buy and when to sell, and it can be used to enhance returns by market timing as investors plan to exit stocks to avoid a bubble. The Marris v is a useful tool for investment based on signals such as dividends or growth —

but not on market value. The net asset value of Apple Inc. is no more linked to its share price than its 700,000 applications. The intellectual capital is more than goodwill which represents the ability of a player in a game to earn an above average return on capital. It should also include a premium on type, playing FMA or SMA and knowing when to reshape strategy in a game. Such intellectual capital might increase the overall valuation of the player because if the player is earning excessive returns on capital, it will invest more capital until Bayesian shareholders are expunged from the shareholder register.

Agency Costs

There is a benchmark rule in Framework Tn=3: the higher the valuation of a company, the less likely is the threat of takeover. This rule, however, intimates that dividends should stay high to maintain the share price. Alternatively, management may wish to invest more profits to secure more growth with a risk that the value of the company falls. If the higher valuation were perceived by shareholders to be at a maximum, then shareholders would prefer that higher valuation, so it behoves management to persuade shareholders that the risk of a fall in value can be captured by a higher growth rate. Management inability to persuade shareholders gives rise to agency costs. The agency costs arise because of the separation of the ownership and control of a firm. Berle and Means, who published a classic study in the 1930s, argue that this separation affords management a considerable degree of discretion; the trust between shareholder (as principal) and management (as agent) comes under threat if management abuse the discretion, and the financial loss to the principal is called an agency cost. One way to tackle the agency costs is for management to design a trust mechanism between shareholder and management, thus enabling shareholders to entrust money to management with a reasonable expectation of getting something back.

Marris Type PLT

A central theme in designing trust is the context of the management decision, that is, how the decision is observed by shareholders.

Shareholders may adopt a Bayesian-type rule, seeing what they want to see about management and the firm. Management should resist this. How? They could signal a positive learning transfer to shareholders whereby management with prior experience in (games with) value-growth issues introduce positive expectations of a stronger performance (higher value for the firm).

This could be achieved through persuading shareholders to view the decision as a continuum rather than as a dichotomy. In other words, the decision has to be framed as a decision about more growth and higher value rather than less value and more growth. Shareholders can then observe the decision of management as a chance wherein making a gain in circumstances where they trust management outweighs the risk of making a loss.

In terms of the competition, management should evolve as strategic players in the sense that they understand that their actions are likely to lead to a reaction from competitors. In other words, they become conscious of the fact that the price of their product depends on the decisions of their competitors, affecting both capacity and market reach of the product. For some products, the combination of overcapacity and technology standardisation will drive prices down, creating low profit margins. In these circumstances, management as a player engage in patching by re-mapping portions of the product's business to changing market opportunities.

If higher value is sacrificed for higher growth in the interim, one element of the trust mechanism should be that the product becomes **a brand with global reach**, dominating its market through expenditure on R&D and advertising. This combination of decisions is what we define as the diversification acreage. Within the acreage of diversified products, if a product is not achieving its global reach and is underperforming, then management should spin off the product.

Marris Hypothesis

Mueller (1972) had advanced the Marris model by advocating a life cycle of firm growth. Mueller's life cycle was a major qualification of the classic linear characterisation of the growth path of a firm advocated

by Marris. Borrowing the arguments first identified by Mueller, we can also think of the Marris model as follows: first, sustainable long-term growth requires market growth; this can be achieved, at a cost, by R&D. In turn, new markets must be supported by new productive capacity. The combined costs of bounded rationality, agency costs, R&D and new capacity may be called the costs of growth. They require cash flow. Cash flow may be obtained from retained profits, new share issues and new debt.

The amount of the last, in any given period, is constrained on one hand by the unwillingness of lenders to offer unrestricted sums relative to the firm's existing scale and size, and on the other by management's fear of the risks, to them, of excessive leverage. Management can pursue a growth rate (implying specific costs of growth and profit retention ratio) that would maximise the firm's valuation or q-ratio. Alternatively, management may pursue a faster growth rate at the price of reducing the valuation ratio to below its maximum. If management have growth-preference, the model closes, with a unique management desired growth rate, and thus the factors that encourage managerial behaviour encourage faster growth of firms; for example, more expenditure on R&D and marketing and hence a positive learning transfer between management and investor shareholders.

It is the trade-off between dividends in time period t and more growth in time period t+1 that gives us our first glimpse of this particular Marris type of management who are motivated by achieving sustainable long-term growth. Management are necessarily risk-averse,

Table 4.1
Return/Risk for *gd*

	High Growth/*gd*	Low Growth/*gd*
Return	Growth drives value	Value drives growth
	Less dividend signals	More dividend signals
Risk	Inability to differentiate fast enough	Innovating at the speed of the slowest firm

working out a risk profile for all decisions in terms of likely outcomes. Ultimately the decisions are binary: either product x or y, but not x and y. The choice of product x carries with it the opportunity costs, in terms of lost revenues and market shares, of not selecting product y. But provided the costs are minimised, the contribution of product x to the achievement of sustainable long-term growth in the company will be positive.

Understanding type will help in identifying the trade-off facing a rival competitor, and this understanding may enable management to predict the likely reactions of the competitor, a significant factor in any competitive interdependent market structure. But in order to understand management behaviour as observed, we need to know more about management type. The third variable is key, and there are three possible candidates:

(1) utility from the classic Marris model,
(2) the valuation ratio from Framework Tn=3 and
(3) profitability.

The latter was applied to Apple Inc as an exercise in MBA workshops and is illustrated in Figure 4.3, while estimation of the Diageo plc BGP can be found in McNutt (2008).

Figure 4.3
Balanced Growth Path for Apple Inc.

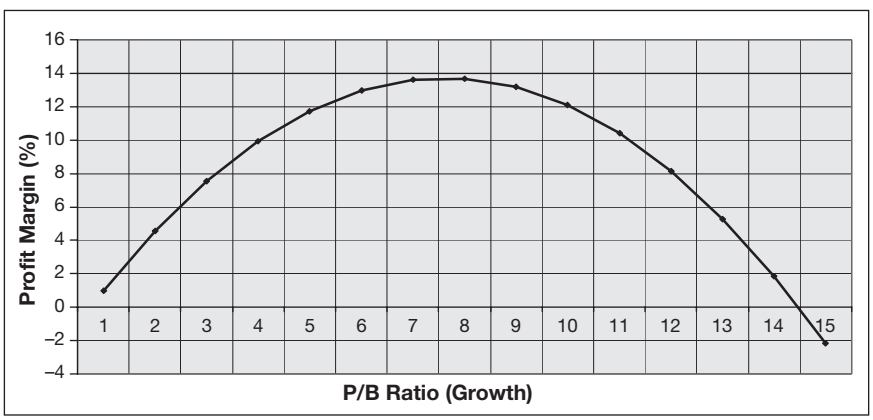


Table 4.2
Marris' Third Variable

Variable X	Variable X	Variable Y	Third Variable, Z
Classic Marris	*gd*	Dividends	V
Diageo plc case in McNutt (2008)	*gd*	Share price	V
Apple Inc. in this chapter (Figure 4.3)	Price/Book ratio	Profit margin	Profitability

If the motives of management reveal their type, then a Marris type, for example, may now be summarised as follows: sustainable long-term growth requires market growth; this can be achieved, at a cost, by R&D. In turn, new markets must be supported by new productive capacity. We are advancing a quadratic equation to compute the BGP, with $a < 0$:

$$\text{McNutt's BGP equation: } y = a(x - h)^2 + k.$$

The position of the BGP in time period $t+1$ can expand or contract, move up or move down. The costs of growth in $t+1$ can be explained by the combined costs of the Penrose effect, the costs of R&D and new capacity. They require a cash flow or leverage, or both.

A cash flow may be obtained from retained profits, new share issues and new debt. If the company does not borrow externally, then the only source of finance for achieving growth is retentions. Herein lies what we shall refer to as a Marris trade-off: **more** in R&D requires more cash and may mean **less** to shareholders in the form of dividend payout. Growth is therefore a function of retained profit.

Marris Signalling

The Z-variable equation represents that unique third variable that signals management type. In the Marris type, we have advocated value v, the market capitalisation of the company divided by its asset (new

book) value as the Z variable. Management of Marris type will signal value maximisation through *gd* growth maximisation as the key variable. Signals can be read from listening to CEO interviews; and as equity traders and analysts become more sophisticated in analysing volatility in equity markets, management may become less concerned about reaching the third variable level and more concerned about signalling their intent to do so. During periods of great movement in equity price, analyst predictions and management signals will feed off each other so that for the share price, p, a signalling maximum could be reached at

$$\text{Signalling maximum: } (\sqrt{p})/p^{-1}$$

For example, a share of number 9 (£9 or €9) could reach a signalling maximum of 27. The author is examining the significance, if any, of this number. Most analysts are bullish on companies with a price/earnings ratio in the range 8 to 10 and a dividend yield of 5 per cent. Equity becomes an attractive investment with relatively lower price/earnings ratios. The numbers send a signal. A signalling maximum recognises the fact that a signal is already in the price. For example, companies with expensive shares that then have a profit downgrade as analysts' targets are not met in time period t may not necessarily experience a fall in the price of shares as investors await target announcements in time period t+1. A good stock to buy is one that is well-placed to weather the storm of mis-signalling as analysts lag behind as chief executive officers engage in PLT. In the classic Marris model, there is mention of a security parameter, a, and it may be possible to rewrite that Marris security parameter in terms of the capitalised value as determined by the signalling share price maximum:

$$a = \text{signalling maximum valuation/replacement cost of net assets}$$

This would allow us to assemble the three ratios, Marris v, Tobin's q and the Marris security parameter, as a measure of stock market value. If we were to exclude financial stocks and exclude intangible assets such as brand value or intellectual property rights from the computation of

the replacement costs, then a value such that $a = v = q < 1$ might indicate a 'buy'.

The signalling strategy can be interpreted as buying equity at $t < T$ and then selling in $t > T$, which gives a long position in the dividends paid out in time period T. Higher-yielding stocks with PLT, paying out a higher proportionate dividend, should deliver a much greater total return in T. Shareholders may prefer a share buyback to the uncertain pay-off from an investment programme. PLT is about reassuring shareholders that no unnecessary risks are being taken and about participating in the market-as-a-game.

Embedded within Figure 4.3 is an inverse demand for dividends. In other words, there is a network effect of more investment from retained profits — the network effect dominates the willingness to accept a level of dividends because less dividends equate with more investment which, in turn, equates with more dividends and more investment. If we define the arithmetic mean of the Marris v as $\bar{v}$, we can advance a mean reversion investment guide on equity:

If $v < \bar{v}$, BUY.
If $v > \bar{v}$, SELL.

The author is considering the possibility of testing an equity valuation equation wherein the variables N = normalised price earnings ratio and PR = pay-out ratio = dividends per share/earnings per share:

$$N = a0 + a1.\ \bar{v} + a2.PR + a3\ [v - \bar{v}] + \varepsilon$$

Any deviation of earnings per share from a trend would alert the intelligent investor to the ability of management to execute strategy in a game. In the game, it is preferable for profits to fall because the firm has engaged in an investment programme than for them to fall because management's short-term planning has resulted in the firm's product lagging behind in differentiation.