

'THE DIVIDEND CONTROVERSY : A STUDY ON THE IMPACT
OF DIVIDEND POLICY ON THE VALUE OF THE FIRM'

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ABSTRACT

The main purpose of this work is to review and examine in detail the controversial issue of how dividend policy affects the value of the firm and to come up with a conclusion based on evidence in a study on 50 top British companies. In the first three chapters the author forwards illustrations on the basic aspects and areas pertaining to dividend policy and company valuation in an effort to have a clear picture of the focal issue. Discussion of the dividend controversy is in Chapter 4. There are three conflicting views and arguments on the subject propagated by three different groups of financial scholars. For simplification, these three groups are divided into conservative, the radical and the middle-of-the-road groups. The conservative group believes in the positive impact of dividend policy where an increase in dividend payout will increase the value of the firm. On the contrary, the radical group believes that the dividend policy has a negative impact on the value of the firm and an increase in the payout will reduce the firm's value. The middle-of-the-road group stresses the irrelevance of dividend policy where the value of the firm is independent of the payout policy. Debates on the effect of dividend policy on the value of the firm are likely to continue until such time that there is concrete empirical evidence on the subject and a solid consensus among financial scholars. The author's conclusion in Chapter 6 is aimed only at throwing some light on this controversial issue.



CHAPTER 1 : INTRODUCTION

1. INTRODUCTION.

1.1 [A fairly generally acceptable assumption is that the principal objective of the firm or company is to maximise the wealth of its shareholders. The firm could achieve this objective in two ways. Firstly by distributing earnings in the form of dividends and secondly by retaining and investing those earnings in expectation of higher returns. The choice between these two alternatives or to reach a right combination between dividends and retained earnings is indeed a difficult decision.] In formulating dividend policy the directors have to take into account a number of factors among which are the firm's ability to pay dividends, the maintainable earnings, the profitability of the projects to be undertaken, the cost of capital, the capital structure, the shareholders preferences and the effect of dividends on the market price of shares. Therefore dividend decisions, or the so-called dividend policy, is one of the major financial decisions since it interrelated with other vital policies of the company such as investment and financing policies. This interrelation leads to the complexity in dividend policy and scholars are still debating the issue as to the impact of dividend policy on the value of the firm. There are conflicting views on this controversial issue which we shall examine it in the latter chapters. However it is advisable for us to briefly and concisely examine and understand the basic terminology and the general aspects and theories of dividend policy and company valuation before we take on the task of discussing the dividend controversy in detail.

CHAPTER 2 : DIVIDEND POLICY

2.1 The Dividend Payment:

2.1.1 A dividend may be defined as that part of the profit of trading that is distributed to members in proportion to their shares and in accordance with their rights as shareholders.¹ A dividend may either be interim i.e. paid during the financial year or final which is recommended by the directors for approval by the shareholders at the annual general meeting. (The majority of companies pay dividends in the form of cash. Cash dividends are usually paid annually or semi-annually.) Very few companies pay it quarterly or monthly. The company may pay a dividend by issuing free additional shares or stock dividends in lieu of cash only if there is a provision for this in its Articles of Association. A stock dividend is simply the payment of additional shares or stock to the existing shareholders. There is no cash payment involved, but only the transfer of a sum from reserves to the ordinary share account. The total number of shares will increase but the proportional ownership of the shareholders remains the same. For example, in a 10% stock dividend, shareholders receive one additional share for every ten shares owned. Some companies may pay stock dividends as a supplement to cash dividends because it might immediately and internally provide funds for financial growth and there is no need for the company to borrow or to issue new shares. However, our discussion here will merely be on the cash dividends because cash dividend payments play an important role in the valuation debate and is at the centre of the controversial views in dividend policy.

2.1.2 In UK, the Companies Act 1980 imposes a few restrictions on

1 Colin Thomas, Company Law, Teach Yourself Book, Hodder and Stoughton Ltd. 1982 p.92.

companies in making distributions of dividend payments.² The basic restriction is that there must be no distribution except out of net realised profit and after making good past losses. A further restriction is that there is no distribution if the net assets of the company will be less than the aggregate of its paid up capital and undistributable reserves. This further restriction prohibits the public companies from making a distribution out of realised profit even if such profits are available without first making good or at least providing for realised deficit or losses.

2.2 Payout Rates:

2.2.1 The payout rate or payout ratio expresses the cash dividends paid per share as a percent of earnings per share (EPS). This ratio is computed by dividing dividend per share (DPS) by earnings per share. For example, a company might adopt a dividend policy of paying dividend per share at 40% of EPS and this policy will be stated in its report to the shareholders. Thus

$$\text{Payout ratio} = \frac{\text{dividend per share}}{\text{earnings per share}}$$

Then theoretically the dividend payment in the coming year (DIV_1) would equal a constant proportion of next year's earnings per share (EPS). Therefore

$$\begin{aligned} \text{DIV}_1 &= \text{target dividend} \\ &= \text{target ratio} \times \text{EPS}_1 \end{aligned}$$

2.2.2 The calculations and decisions on the payout ratios are the subject of earlier debates which were prolonged and without any firm conclusions. This ratio and dividend policy are the crux of the later controversy on the impact of dividends on the value of the firms.

John Lintner in his survey in 1956, came up with a conclusion that the firms should have a steady and progressive long term target payout ratio since the shareholders (owners) seemed to prefer a stable dividend.³ In other words he believed that the shareholders should be paid a stable dividend even if the firm experienced a fluctuation in earnings. However, Fama and Babiak, based on their study on 392 US companies concluded that current earnings have the greatest influence on the payout ratio and target payout ratio.⁴ They estimated the target ratio and adjustment rate for each company and found out that on average, firms aimed to pay out almost half of their net earnings (profit).

2.3 Dividend Cover:

2.3.1 (Dividend cover is the reciprocal of a payout ratio. It shows the number of times the amount of dividend payment could be covered by attributable earnings.) In other words, it is the ratio between EPS and the ordinary dividend per share (DPS). This is better illustrated in Table 2.1 below which gives information about the dividend policy of the Associated British Foods PLC from 1978 to 1983.

TABLE 2.1 : Associated British Foods PLC, Earnings and Dividends Record 1978 - 1983

YEAR	EARNINGS (£000)	DIVIDENDS (ordinary £000)	Dividend Ratio %	Dividend Cover	EPS (Pence)	DPS
1978	49,996	8,276	16.6	6.0	13.5	2.235
1979	54,337	9,270	17.1	5.8	14.0	2.388
1980	66,101	13,311	20.1	4.9	17.0	3.423
1981	67,031	13,657	20.4	4.9	18.7	3.809
1982	83,699	15,463	18.5	5.4	22.3	4.119
1983	82,765	17,052	20.6	4.9	23.0	4.739

Source: Associated British Foods PLC Reports & Accounts 1982 pp 24,25 & 35 and 1983 pp 16,22 & 35.

³ J. Lintner, 'Distribution of Incomes of Corporations Among Dividends, Retained earnings And Taxes', American Economic Review, 46:97-113, May 1956.
⁴ E.F. Fama and H. Babiak, 'Dividend Policy: An Empirical Analysis', Journal of the American Statistical Association, 63:1132-1161, December 1968.

In 1983 a cover of 4.9 means for every 4.9 p of earnings, 1p is paid out as dividend. Therefore, a cover of 4.9 indicates a payout ratio of $1/4.9$ or 20.6 percent. Alternatively we can get the same payout ratio by dividing DPS of 4.739 by EPS of 23.0. Dividend per share (DPS) is the actual amount of dividend paid (or proposed to be paid) to the ordinary shareholders. This DPS can be established by dividing the dividend amount by the total number of ordinary shares.

2.4 Dividend Percentage and Dividend Yield Percentage:

2.4.1 Dividend percentage is the amount of dividend expressed as a percentage of the nominal value of the ordinary shares. For example, in 1983 the dividend percentage for Associated British Foods was 94 percent since the DPS for that year was 4.739p and the nominal value of each ordinary share was 5p. On the other hand, the dividend yield percentage refers to the amount of dividend payment expressed as a percentage of the market price of the ordinary shares. Therefore, in 1983 dividend yield percentage for each Associated British Foods share was 3.24 percent since the market price was 146.36p⁵. Summarily we can express dividend percentage as $k_d = \text{DPS}/P_n \times 100$ where P_n is the nominal price of shares, and dividend yield percentage as $k_{dy} = \text{DPS}/P$ where P is the market price of shares. The higher the market price, the smaller the yield for a given amount of dividend payment. The smaller the yield the higher is the dividend cover and conversely the higher the yield the lower is the cover because the yield and cover are inversely related.

2.4.2 For the financial analysts, dividend yield percentage is more meaningful than dividend percentage because it can be used as a yardstick to realistically assess a company's dividend policy. Also in

5 This market price of 146.36p is the average of the highest and the lowest prices in 1983. The highest and the lowest prices were 167.27p and 125.45p respectively.

our later discussion the dividend yield will be focused on as one of the strong arguments used by some financial scholars to support their views on the dividend controversy because of the association of dividend payment and the market price of shares.

2.5 Major Influences On Dividend Policy:

2.5.1 Legal constraints and restrictions as mentioned in paragraph 2.1.2 above provide a framework for dividend policy decisions. However, from the company's viewpoint, theoretically there are other economic and financial factors which have a major influence on its dividend policy. ^① A company's liquidity or cash position is one of the considerations regarding whether to pay a dividend or otherwise. If the company has the ability to pay a dividend, this liquidity again will influence the payout ratio. A fast growing company with a pressing need for fund to take advantage of future profitable investment opportunities will surely favour a high retention rate, and a low payout ratio or may decide not to pay a cash dividend at all.

2.5.2 ^② The stability of earnings is another factor which influences dividend policy. A firm with a stable earnings record and predictable future earnings is more likely to pay out high dividend than is a firm with fluctuating earnings. Also, a firm with stable earnings and profitability records will have easier access to capital markets and forms of external financing without relying so much on retained earnings. This type of firm is therefore in the position to reap the tax advantage of debts or loans. A well established firm is thus likely to have a higher payout rate than is a new or small firm.

4 2.5.3 The tax position of the shareholders also greatly influences the directors in their dividend policy decisions. If majority of the shareholders are in the high income tax bracket, then their preference

will be for a low dividend payout. This type of shareholders or investors would be more interested in taking their income in the form of capital gains rather than as dividends.⁶ In contrast, those shareholders in a low tax bracket and possibly in a 'low income' class would prefer a relatively high dividend payout rate to finance their immediate consumption expenditures especially in time of escalating inflation.⁷ The company's directors should be able to consider and compromise the conflicting shareholders' interests and preferences - the so-called 'clienteles influence' in dividend decisions.

2.5.4 (Higher dividend payout ratios are weighted more heavily)
 by investors, creditors and also the general public.) Regularly growing dividends tend to raise the share prices as compared to fluctuating dividends. Higher share prices are also viewed as a sign of personal success to the directors, officers and employees of the company. More importantly, from the directors' viewpoint higher share prices are often associated with a lower cost of financing through equity because it reduces the number of new shares to be issued to raise a required amount of funds.

6 One of the findings of Elton and Gruber in their study on the shareholders tax rates and the clienteles effect is that shareholders in higher tax brackets show a preference for capital gains over dividend income relative to those in lower tax brackets. See Elton E and Gruber M, 'Marginal stockholder tax rates and the clienteles effect', *Review of Economics and Statistics* 52 (1) 1970 pp 68 - 74 .

7, A general observation in *Economist* on dividend controls by the British government stated that, despite governmental controls, since 1960 dividends have very nearly kept pace with inflation. A Simon & Coates' chart was reproduced on page 123 .(*Economist* May 20 1970 pp 123 - 124.

CHAPTER 3 : COMPANY VALUATION

3.1 Valuation of a firm :

3.1.1 According to Paish and Briston, normally there are three occasions or circumstances when company valuations are necessary.⁸ The first occasion is when a company is seeking a loan and the loan creditor has to look for a certain degree of security for his loan. (Creditors's valuation of a borrowing company will be on its assets which may be also dependent on earnings capacity and future profitability.) The second common occasion which necessitates valuation is in take over and merger situations. Before proceeding with the bid, the acquiring company has to make complete assessment and valuation of the 'victim' company as to its assets, share prices and potential future earnings. The third occasion is in the event of liquidation, either compulsory (by the court making a winding up order) or voluntary where all types of company's assets (except goodwill) have to be valued and sold in order to settle all debts and liabilities. In this very situation, a company ceases to have any future prospects and the value of the company (liquidating values) depends only upon how much buyers are prepared to pay for its assets.

* 3.1.2 It is important to clarify here that our main concern about company valuation is from the viewpoint of the shareholders because, as stated earlier, the main objective of the firm is to maximise shareholders' wealth. Different groups of shareholders might have different expectations from their shareholdings but their ultimate objective remains the same i.e. wealth maximisation. As far as the small shareholder is concerned, the expectations are for the economic benefits such as annual dividends and growth in

⁸ Paish F.W. and Briston R.J. 'Business Finance', Pitman, Fifth Edition, 1978 p.59.

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the value of shares while for the shareholder with a controlling interest in a company, the value of assets and the level of total earnings may be the attraction for investing in the company. However, for the majority of the shareholders their valuation of a firm or company are normally based on dividend (either past or expected) and the market price of the ordinary shares (capital gains). Therefore throughout this discussion the value of a firm will be defined and referred to as a combination of these two main elements i.e. dividends and the market price of the ordinary shares.

3.2 The Valuation of Ordinary Shares :

3.2.1 In this discussion also, the author will only refer to the ordinary shares of listed companies instead of preference shares because decisions on dividend payment to the ordinary shares are more complex and the impact of dividend on ordinary share prices is controversial. As for preference shares, they carry regular and fixed dividend payments and this dividend has no clear impact on the value or the prices of the preference shares.

3.2.2 Apparently there is no single generally accepted method for determining the correct valuation of a company's share. Theoretically the valuation has several forms. There are valuation approaches based on dividends, earnings (cashflows) and the market price, taking into account the actual and future performance of the company.

3.2.3 Ordinary shareholders as owners of the company are entitled to a revenue stream i.e. the stream of future dividends. The value of the ordinary shares corresponds to the present value of this

stream of dividend payments. We are still uncertain about the size of the future dividends although more and more companies nowadays subscribe to the constant dividend (payout) policy. Changes in expectations about future dividends and capital gains cause fluctuations in share prices. Selling and buying of shares are example of transactions based on dividend expectations. The seller might wish to obtain capital gains but the buyers are buying a stream of future dividend payments besides the expectations of future capital appreciation. Therefore once again the share prices will be determined by future dividend expectations. To illustrate this, let us assume that there is a transaction between a share - holder and an investor. If this investor is to hold the share for three years then the value of the share to him is the present value of the three dividend payments (assuming dividends are paid annually) plus the discounted value of the price he will receive on selling the share (i.e. the capital gains). Let P_0 be the price of share today and P_3 is the price at the end of the third year. D_1 is dividend per share (DPS) to be received at the end of the first year while D_2 , D_3 and D_4 are the DPS at the end of the second year, third year and fourth year respectively. i is the discount rate, then the market price of share today is

$$P_0 = \frac{D_1}{(1+i)} + \frac{D_2}{(1+i)^2} + \frac{D_3}{(1+i)^3} + \frac{P_3}{(1+i)^3} \quad (3.1)$$

The investor who buys the share at the end of the third year pays P_3 for it and expects to hold it for three years. So, look at time 0

$$\frac{P_3}{(1+i)^3} = \frac{D_4}{(1+i)^4} + \frac{D_5}{(1+i)^5} + \frac{D_6}{(1+i)^6} + \frac{P_6}{(1+i)^6} \quad (3.2)$$

The price at the end of the sixth year and all future prices are determined in a similar way. Therefore the equation for the price of a share at the present time can be rewritten as

$$P_0 = \frac{D_1}{(1+i)} + \frac{D_2}{(1+i)^2} + \frac{D_3}{(1+i)^3} + \frac{D_4}{(1+i)^4} + \dots$$

$$= \sum_{t=1}^{\infty} \frac{D_t}{(1+i)^t} \quad (3.3)$$

The above equation can be modified to take into account the expected growth in dividend payments. Let g be the expected percentage rate of growth, then the formula becomes

$$P_0 = \frac{D_0(1+g)}{(1+i)} + \frac{D_0(1+g)^2}{(1+i)^2} + \frac{D_0(1+g)^3}{(1+i)^3} + \frac{D_0(1+g)^4}{(1+i)^4} + \dots$$

$$= \sum_{t=1}^{\infty} \frac{D_0(1+g)^t}{(1+i)^t} \quad (3.4)$$

If g is assumed to be constant, then equation 3.4 may be further rewritten as

$$P_0 = \frac{D_1}{i - g} \quad (3.5)$$

3.3 Factors affecting the market price of shares:

3.3.1 Like the price of anything else, the price of a share depends upon supply and demand and, as described above, the expectations of buyers and sellers. The company has an influence over the supply or issuance of new shares but it has very limited influence on the price of 'old' shares being sold in the market. The demand for shares is again not under the control of the company. However, the company by its performance and the information it makes available to the market, can influence

the demand for its shares and also the willingness of existing holders to sell.

3.3.2 According to Brian Ogley good or bad news of major international events, or expectations may affect share prices at least temporarily.⁹ Interest rates (either domestic or international) are volatile and share prices tend to move inversely with these interest rates. Pressures on liquidity cause prices to fall as shareholders have to sell to obtain cash especially during a credit squeeze when they might be unable to borrow against the collateral of the securities. Pressure on liquidity was a major factor in the 1973/1974 UK stock market collapse which co-incident with the unexpected oil price explosion .

3.3.3 Theoretically, any one or more of the following could have at least short run effects on the market price of a company's shares : (1) announcement of a capitalisation issue ; (2) a rights issue ; (3) a dividend declaration ; (4) change from a 'cum scrip', 'cum rights' or 'cum dividends' to an 'ex-scrip', etc. position ; (5) publication of an interim statement or the final figures for the year, or the annual report ; (6) rumours of a takeover bid either by or for the company - the share price of the offering company tends to fall while the shares of the potential 'victim' company will rise; (7) an announcement of a merger or amalgamation ; (8) announcement of new products, patents etc.; (9) a change in interest rates ; (10) a change in taxation ; (11) a change in government policy

9 Brian Ogley, 'Business Finance', Longman 1981, p471.

likely to affect the company, or reports of national or international events thought likely to have a similar effect; (12) press comments.

CHAPTER 4 : THE DIVIDEND CONTROVERSY.

4.1 The Dividend Controversy : An Overview.

4.1.1. The whole question of dividend policy is still controversial, and to some extent economists find dividends mysterious.⁹ Miller and Modigliani (MM) initiated the debates on the issue with the publication of their provocative paper on the 'irrelevance hypothesis' in 1961.¹⁰ MM under the assumptions of perfect capital markets, rational behaviour and a world without taxes, demonstrated that the value of the firm does not depend on its dividend payout rate. However, the conservative group which believes in the positive impact of dividend policy is moving on to stronger grounds with the support of empirical studies by several financial scholars. The relevance of dividend policy becomes clearer in imperfect or inefficient markets with the presence of several factors such as taxation, transactions costs, and indivisible investment opportunities. Debates on the dividend controversy then focus on the arguments about market imperfections or inefficiencies where a 'leftist' group emphasising taxes believes that an increase in dividend payout will reduce the firm's value. Wilkes (1977) stressed that in reality it is generally accepted that dividend policy does matter.¹¹

4.2 The Irrelevance Hypothesis:

② 4.2.1 As stated above, Miller and Modigliani (1961) have demonstrated that, in the absence of imperfections in the market, dividend policy

9 Easterbrook, Frank H., 'Two agency-cost explanations of dividends', The American Economic Review, September 1984 p.650.

10 Miller M.H. and Modigliani F. Op.cit

11 Wilkes, 'Dividend policy and investment appraisal in imperfect capital markets', Journal of Business Finance and Accounting Vol.4 No.2 (1977) p.188

should not affect the value of the firm or the shareholders' wealth. Their conclusion is that the shareholders' wealth is unaffected by current and future dividend decisions but it depends entirely upon the expected future earnings stream of the firm. Besides the basic assumptions of a perfect capital market, rational behaviour and perfect certainty, the investment policy is assumed to be given, (ie dividends never interfere with investment policy). By ignoring tax, MM further assumed that it would not matter whether the investment and dividend policies were financed by debt or a new issue of equity.¹² MM's fundamental argument is that effect of dividends on share prices is precisely offset by other forms of financing, for example, the fall in the firm's value as a result of dividends payment will be offset by external financing.

4.2.2 MM defined the market prices of a share at the start of a period as equalling the present value of the dividend paid at the end of that period plus the market price at the end of that period. Their original equation is modified here for simplification.¹³

$$P_0 = \frac{1}{(1+k)} (D_1 + P_1) \quad (4.2.1)$$

12 However, Franco Modigliani himself admitted in his recent article that those MM assumptions and conclusion 'did not carry over to a world with taxes which have been and still a continuing source of trouble'. See Modigliani F., 'Debt, dividend policy, taxes, inflation and market valuation', Journal of finance, Vol.37, No.2 May 1982 p.255

13 MM's (1961) original equation was

$$P_j(t) = \frac{1}{1+p(t)} \left[d_j(t) + P_j(t+1) \right]$$

Where $P(t)$ = the price (ex any dividend in $t-1$) of a share in firm j at the start of period t , $d_j(t)$ = dividends per share paid by firm j during period t and $p(t)$ = capitalisation rate which is independent of j .

where P_0 is the market price per share at the start; k is the capitalisation rate appropriate to the company's equivalent return (risk) class; D_1 is the dividend at the end of the period and P_1 is the market price per share at the end of the period. If n is the number of shares in issue at the start of the period and m is the number of new shares issued at the end of the period at price P_1 ,

$$nP_0 = \frac{1}{(1+k)} \left[(nD_1 + (n+m)P_1 - mP_1) \right] \quad (4.2.2)$$

The above equation says that the total value of all shares in issue at the start (nP_0) equals the present value of total dividends paid on them (nD_1) plus the total value of all shares in issue at the end of the period $\left[(n+m)P_1 \right]$ minus the total value of new shares issued at the end (mP_1). The new shares issued at the end depends upon the investment (I) not financed by retained earnings. If X is the total earnings before dividends then $X - nD_1$ is the retained earnings available for the financing of I . Any shortfall is made up by a new issue of shares.

$$mP_1 = I - (X - nD_1) \quad (4.2.3)$$

The substitution of equation (4.2.3) into the equation (4.2.2) results in the cancelling out of the nD_1 expression, giving the present value of the shares in issue at the start is

$$nP_0 = \frac{1}{(1+k)} \left[(n+m)P_1 - I + X \right] \quad (4.2.4)$$

According to MM, because nD_1 does not appear directly among the variables and since X , I , P_1 and k are independent of nD_1 , the present value of a company is independent of the current dividend decision. The gains made by the existing equity holder in higher dividends would be offset exactly by the reduction in the value of his shares. MM further argued that the same would be true of all future dividend decisions. The price of shares is determined solely by expectations of the risk and return characteristics of the future earnings stream which are dependent upon the firm's investment strategy. To put it in MM words (1961 p 413):

"Like many other propositions in economics the irrelevance of dividend policy, is 'obvious, once you think of it'. It is, after all, merely one more instance of the general principle that there no 'financial illusions' in a rational and perfect economic environment. Values there are determined solely by 'real' considerations- in this case the earning power of the firm's assets and its investment policy - and not by how the fruits of the earning power are 'packaged' for distribution"

4.2.3 Black and Scholes are among the other proponents of dividend irrelevance even in the presence of taxes.¹⁴ Based on their empirical results they concluded that a corporation that increases its dividend can expect that this will have no definite effect on its stock price.¹⁵

✓ 14 Fisher Black and Myron Scholes, 'The effect of Dividend Yield and Dividend Policy On Common Stock Prices and Returns', Journal of Financial Economics 1 (1974) pp 1-22

15 Ibid p.21

Their main assumption is that a corporation can always choose any dividend policy it wants without changing its investment policy. They substantiated their arguments by considering various 'effects' such as the so-called supply effect, tax effect, information effect, diversification effect and uncertainty effects. According to Black and Scholes, being aware of the tax differential and the investors' tax brackets and preferences, corporations will adjust their dividend policies to 'supply' the levels of yield that are most in demand at any particular time. Equilibrium is reached when the supply of shares of that level of yield matched its demand and at this point, they argued that no corporation will be able to affect its share price by changing its dividend policy. Another argument is that the uncertainty in the effect of dividend yield on stock returns is so great and neither taxable investors nor tax-exempt investors know how to adjust their portfolio.¹⁶ As a result of this uncertainty and the probable costs in terms of loss of diversification and higher turnover, the investors may decide to ignore dividend yield entirely. Therefore Black and Scholes' conclusion is that, even with taxes, dividend policy will be irrelevant.

4.2.4 Empirical studies by Pettit (1977) failed to show or identify a relationship between the market price of shares and the dividend policy of the firm. Instead his cross-sectional studies of market prices revealed that the relationship was independent of dividend

16 Ibid pp 4 and 17. Empirical results of their study show that that the constant \hat{Y}_i is not significantly different from zero where its value is around 1% per year which makes it statistically insignificant. This means that the expected returns on high yield stocks are not significantly different from the expected returns on low yield stocks, or in other words, shares with high payout ratios do not provide returns significantly different from those with low payout ratios.

policy. As he put it in his conclusion :

"Nevertheless, just as studies of security prices have been unable to detect the existence of such a relationship, such a relationship as identified in this study in no way suggests that the market price of a security is determined by the dividend policy followed by the firm. There is in fact no reason to expect that firms will not set their policy in light of tax and transaction cost-induced preferences of individuals that make up the market. As a result, no one firm will be able to benefit by a shift in its dividend policy, and cross-sectional studies of market price will find the relationship to be independent of dividend paid."¹⁷

4.2.5 (Miller and Scholes (1978) came up with another argument to support the dividends irrelevance hypothesis even in the existence of differential tax treatment in favour of capital gains.¹⁸ The investors can 'neutralize' the taxes on dividends by borrowing and re-investing to offset the interest payment against dividend income. The capital gain on the investment of the borrowed funds is sheltered. According to them a 'neutralisation' through 'home made leverage' can be achieved if that dividend income is transformed into capital gains by buying a straight life insurance policy, government bonds or increasing the contribution to a pension plan. In this case the value of investor's wealth is unaffected and they are indifferent between dividends and capital gains, in spite of that tax bias. Therefore the conclusion remains that the dividend policy is irrelevant.

17 Pettit R.R. 'Taxes, transaction costs and the clientele effect of dividends.', Journal of Financial Economics, 5 (1977) p 435.

18 Miller, Milton H. and Scholes M.S., 'Dividends and Taxes' Journal of Financial Economics, 6 (December 1978) pp 333 - 364 .

4.3 The Residual Theory of Dividends:

4.3.1 The residual theory of dividends takes the view that the firm will use as much of its earnings as is necessary to meet all investment opportunities yielding a return which is higher than what shareholders could obtain outside the firm. The shareholders are said to be indifferent between dividends and retained earnings as those acceptable new investment will produce higher returns. Therefore this theory implies that the shareholders will receive dividends only if the firm has retained earnings left over after financing all those acceptable investment opportunities. Theoretically, the amount of dividend (payout) will then fluctuate from period to period in keeping with fluctuations in the amount of feasible and acceptable investment opportunities available. However the firms may smooth out and stabilize the dividend payment by establishing 'residual funds' and saving some amount in period of surplus earning.

4.3.2 This residual theory of dividends lends support to the irrelevance of dividends. The interpretation is that the dividend policy is irrelevant since the firm's investment and financing policies are the most important financial decisions in determining future earnings and shareholders' wealth. The basic assumption of this theory is that firms attempt to maximise shareholders' wealth (profit) by investing capital and retained earnings in new projects up to the point where the marginal return on new investment equals the marginal cost of capital. Retained earnings, equity and debt are three main sources of capital for the firm wishing to expand its investment programme. The marginal cost of capital will be at a minimum when the firm finds its optimum capital structure i.e. the right combination or mix

between equity and debt, when the firm, after utilising all or part of its retained earnings, increases its equity to finance investment projects, its 'gearing' will no longer be optimal. In this situation the marginal cost of capital will increase because the cost of equity, as generally accepted, is greater than the costs of debt. The firm has to issue additional debt to maintain the optimum capital mix and at the same time to reduce the cost of capital. Thus the new investment will be financed partly by debt and partly by equity and retained earnings. If the firm has a large retained earnings which is sufficient or just enough to finance those investment without relying on debt or new equity, the firm may utilise all of its retained earnings and continue to hold its optimum capital structure. In this case, however, no dividend will be paid to the shareholders. Dividend payment (policy) is clearly the residual of the investment and financing policies and therefore irrelevant. } ✓

4.4 The Positive Impact of Dividends:

4.4.1 A traditional viewpoint is that there is a direct relationship between dividend payout ratios and ordinary share price and investors prefer a current, certain return in the form of dividends rather than capital gains despite the existence of differential tax rates. Thus the MM (1961) 'irrelevance hypothesis' was a clear contrast to this long standing 'conservative' position which believes that dividends and the increase in payout ratios will increase the market value of a firm. In reality, MM's assumptions of a perfect capital market and conditions of certainty and rational investors do not exist therefore the majority of researchers concluded that

dividend is 'relevant'. An increase in the dividend payout ratio is usually followed by an increase in share price, as investors assume that the higher dividend is a 'signal' or indicative of the firm being in a prosperous position and so profit expectation increases. We will discuss on the information content of dividends or the so - called 'signalling hypothesis' later.

4.4.2 A positive dividends impact has been suggested since the early fifties by many outstanding researchers such as Graham and Dodd (1951, 1962), Lintner (1956) and Gordon (1959). They were then supported by Brittain (1964) Brennan (1970), Ryan (1974), Long (1978), Litzenberger and Ramaswamy (1977, 1982) and Asquith and Mullins (1983). Graham and Dodd found that an extra dollar of dividends has greater effect on the share price than an extra dollar of retained earnings.¹⁹ Their studies indicated that a dollar of dividends had four times the average of impact on share price as did a dollar of retained earnings. Gordon Gordon (1959) based on regression models in his studies on 164 corporations concluded that the multiplier effect of dividends on share price is greater than the retained earnings multiplier although the size of the difference varies considerably from industry to industry (ie chemicals, Foods, Steel and Machine Tools) and from year to year.²⁰ Therefore as he said 'the first point to be noted is that the dividend hypothesis is correct regardless of whether the earnings hypothesis is correct'.²¹

19 Graham B and Dodd D.L 'Security Analysis: Principles and Techniques' 3rd Ed. Mc Graw Hill New York 1951

20 Gordon M 'Dividends, Earnings and Stock Prices', Review of Economics and statistics, 41 (2) May 1959 pp 99 - 155

21 Ibid p. 103

Gordon's conclusion was supported by Benishay a few years later.²² In his regressions, he found out the relationship of X_3 (ie the payout ratio) with the rate of return especially when growth is held constant. He stressed that, for the same growth rate, a company with a higher payout ratio is a company which was more successful in the past and may be expected to continue to be more profitable in the future.²³

4.4.3 Terence M. Ryan in his cross-sectional study of 60 British firms found that the firms' dividend policies are significantly affected by considerations of future capital needs and the reliability of the earnings stream. The larger the firm, the easier access it has to the capital markets as external sources of finance and hence the less its dependence on retained earnings.²⁴ Ryan has investigated the validity of the dividend irrelevance hypothesis in the British context and his results show that the investors tend to capitalise distributed dividends at a higher rate than retained earnings. Therefore his conclusion (suggestion) is that 'each pound of distributed dividends contributed substantially more to company valuation than did a pound of retained earnings.'²⁵

4.4.4 The 'conservative' group forwarded some explanation and empirical evidence as to why firms keep on paying generous dividends despite the tax disadvantage. Important theoretical contributions have been

22 Benishay H., 'Variability In Earnings-Price Ratios of Corporate Equities.', American Economic Review Vol.51 March 1961 pp 81-84.

23 Ibid p.91

24 Terence M. Ryan, 'Dividend Policy and Market Valuation in British Industry.' Journal of Business Finance & Accounting Vol.1, 1974 pp 415 - 428 .

25 Ibid p 422.

made by Brennan (1970) and Long (1978) both of whom incorporate differential taxation of dividends and capital gains into the standard mean-variance models (framework). Brennan (1970) was first to extend the single period CAPM (Capital Asset Pricing Model) into a two parameter after-tax model to include the preferential tax treatment of capital gains.²⁶ He formulated an equilibrium relationship as $E(\bar{R}_i) - rf = b\beta_i + \bar{\pi}(d_i - rf)$, where \bar{R}_i is the before tax total return to share i , β_i is its systematic risk, $b = E(R_m) - rf - \bar{\pi}(d_m - rf)$ is the after tax excess rate of return on the market portfolio, rf is the risk free rate of interest, d_i is the dividend yield on share i , and subscript m denotes the market portfolio. $\bar{\pi}$ is a positive coefficient for the taxation of dividends and interest as ordinary income and taxation of capital gains at a preferential rate. The result shows that for for the same level of risk, the after-tax expected rate of return of a stock (share) is an increasing function of its dividend yield. Long's results are consistent and he finds that dividends appear to be somewhat more highly valued than capital gains.²⁷

4.4.5 Litzenberger and Ramaswamy (1979,1982) have obtained results which are consistent with the 'conservative' views. Their after-tax CAPM model and the econometric techniques are considered as the extension of Brennan's analysis to take into account a progressive

26 Brennan, M. J., 1970 'Taxes, Market Valuation and Corporate Financial Policy', National Tax Journal 23 (4) pp 297-330.

27 Long, J. B. Jr., 1978 'The Market Valuation of Cash Dividends: a case to consider', Journal of Financial Economics, 6 pp 235-264.

tax scheme and both wealth income related constraints on borrowing.²⁸ The extended equilibrium relationship is $E(R_i - rf) = a + bB_i + c(d_i - rf)$ where $E(R_i)$ is the expected return on security i , 'a' is the excess return on a zero beta portfolio (relative to the market) whose dividend yield is equal to the riskless rate, 'b' is the after-tax excess rate of return and 'c' is the income related constraint on borrowing. Their model shows the existence of a linear relationship between before-tax rates of return and dividend yield and systematic risk. Further tests of this relationship were conducted using the sample estimate of the variances of observed betas and the results indicate that there is a 'strong' positive relationship between dividend yield and expected return.

4.4.6 The most recent empirical studies by Asquith and Mullins (1983) and Divecha and Morse (1983) added weighty support to the previous studies mentioned above. Asquith and Mullins have analysed a sample of 168 listed firms that neither pay the first or initial dividend after their incorporation (establishment) or after a 10-year span (hiatus).²⁹ The impact of the subsequent dividend payments is also empirically examined. Their cross-sectional regression equation is $XRET_i = \alpha + B(\Delta \text{yield}_i) + E_i$ where $XRET_i$ is the estimated excess return for firm i on the second day after dividend announcement and Δyield is

✓28 Litzenberger R.H. and Ramaswamy K., 'The Effects of Personal Taxes And Dividends on Capital Asset Prices: Theory and Empirical Evidence.' *Journal of Financial Economics*, 7 1979 pp 163 -195 . According to them, there are two types of constraints on individual borrowing. The first constrains the maximum interest on riskless borrowing to be equal to the individual's dividend income and the second is a margin requirement that restricts the fraction of security holding that may be financed through borrowing.

29 Asquith P. and Mullins D.W. 'The Impact of Initiating Dividend payments On Shareholders' wealth.' *Journal of Business*, January 1983, pp 77 - 96 .

the annualised change in yield for firm *i* as calculated by the new dividend minus the old dividend by the firm's previous-month-end stock price.³⁰ The empirical results of their study show initial dividends has a large positive impact on shareprices or shareholders' wealth while subsequent dividend increases might produce a larger positive impact. They found out that the positive excess returns were independent of any other contemporaneous events such as earnings announcements by the firms. The findings also are considered to be consistent with the general view that dividends convey unique, valuable information to the market, or as Asquith and Mullins put it, dividend policy as an 'information transmission mechanism'. Divecha and Morse obtained similar results from their studies on the impact of the dividend increase announcements over a shorter period (i.e. 20 days before and after the announcements).³¹ Their conclusion is that the announcement of dividend increases is associated with stock price increases and the abnormal returns are directly related to the proportional change in dividends. Their results also tend to support the 'information content of dividend' hypothesis.

4.5 The Information Content of Dividend Hypothesis :

4.5.1 The information content of dividend hypothesis states that dividends convey information about future earnings and profitability of the firm. It is widely recognised that any increase in dividends is followed by an increase in share price, thus this hypothesis seems to

30 Ibid. p.91

31 Arjun Divecha and Dale Morse, 'Market Responses to Dividend Increases and Changes in Payout Ratios.', *Journal of Financial and Quantitative Analysis*, Vol.18 No.2 June 1983 pp 163 - 173.

support the positive impact of dividends. However, another interpretation is that a dividend change is only an 'information transmission mechanism' or a 'signal' to the market to enable the market participants to predict future earnings more accurately based on the revised expectations of managers. This second interpretation, in contrast to the earlier interpretation, tends to support the 'irrelevance hypothesis' because it is only the information content of the dividend which has a direct effect on share prices but not the dividend itself. The information content of dividend hypothesis has been tested in several empirical studies, however the evidence presented appeared inconclusive. Therefore, according to Paul (1983) this hypothesis is still an open question and subject to further empirical research and studies.³² We will re-examine these studies to come up with a general conclusion.

4.5.2 Modigliani and Miller (1959) made the first statement on the 'informational content of dividends' in their reply to a comment by David Durand who argued on the existence of strong positive cross-sectional correlations of share price and cost of capital with dividends and earnings.³³ MM with their unique assumptions of perfect capital market, rational behaviour and a no tax world, have demonstrated in

32 Roy S. Paul, 'Analyst Forecasts and Dividend Information.' Journal of Economic Studies, Vol. 10, No. 2 1983 pp 3-20 . Results of his studies do not support the hypothesis, however he concluded that due to 'multicollinearity', dividend might contain much the same information as earnings.

33 Modigliani F. and Miller M.H., 'The Cost of Capital, Corporation Finance and The Theory of Investment, A Reply,' American Economic Review, 49 (September) 1959 pp 635-655.

their earlier article that the share price does not depend on the firm's dividend policy.³⁴ A change in stock price is merely a reflection of 'the role of dividends as a proxy measure of long-term earnings anticipations.'³⁵ Therefore they then re-emphasised their position and argued that such a relationship as found by Durand was only a 'temporary disturbance' which is not a 'permanent' relationship.³⁶ Later, in their controversial paper, MM (1961) reiterated that where a firm has adopted a stable dividend policy, a change in that policy will reflect the management views of future profits and maintainable earnings. Therefore, according to them, the dividend change provides the occasion for the reflection of future earnings and growth opportunities or in other words, such changes may function as prediction of future earnings.³⁷

4.5.3 Pettit (1972) was the first to offer empirical studies on a set of 625 firms to test the hypothesis, whether dividends do contain important information and changes in dividend levels convey that information to the market participants or otherwise.³⁸ He found that dividend announcements do convey substantial information and the market makes use of these valuable announcements in assessing the value of a security. Pettit (1976) in his effort to reconcile conflicting views

34 Modigliani F. and Miller M.H., 'The Cost of Capital, Corporation Finance And The Theory of Investment: Comment' American Economic Review 48 (June 1958) pp 261 - 297 .

35 Ibid, pp 287-288.

36 Modigliani F. and Millier M.H. (1959) Op,Cit p666.

37 Miller M.H. and Modigliani F.(1961) Op.Cit.p 431. Actually the MM argument is an extension of a pioneering work by Lintner (1956) who investigated a relationship between expected future earnings and 'target' corporate dividends, to which dividends have been assumed to adjust gradually.

38 Pettit R.R., 'Dividend Announcement and Security Performance, and Capital Market Efficiency.' Journal of Finance, 27(5) Dec. 1972 pp 993-1007

on the subject reconsolidated his conclusion by further arguing that dividend announcements supply relevant information over and above that conveyed reported earnings.³⁹ His conclusion was supported by Laub (1976) who also found some evidence that dividend announcements convey information about future earnings prospects that is not inherent in the time series of past earnings.⁴⁰ The other group which has contradicting views and conclusion to Pettit and Laub is led by Watts. Based on his regression tests on the information hypothesis Watts (1973) found that the 'potential' content of dividends and the average absolute size of the future earnings changes which might be conveyed by unexpected dividend changes were very small. The main conclusion of his studies is that 'in general the information content of dividends can only be trivial.'⁴¹ Watts's conclusion was then supported by Gonedes (1978). Gonedes contended that dividend and extraordinary items reflect no information beyond that reflected in contemporaneous signals such as income signals or in other words, dividend changes do not reflect any 'special' managerial information about future distributable earnings.⁴²

4.5.4 Bhattacharya (1979) developed a model in which cash dividends function as a signal of expected cash flows of firms in an imperfect-information situation.⁴³ His model is based on a 'feasible signaling'

39 Pettit R.R. 'The Impact of Dividends and Earnings Announcements: A Reconciliation.' *Journal of Business* 49(1) 1976 pp 86-96.

40 Laub, P.M., 'On The Information Content of Dividends', *Journal of Business* 49(1) 1976 pp 73-80.

41 Watts R, 'The Information content of Dividends' *Journal of Business* 46 (2) 1973, p 211. See also Watts's comments on 'On the Informational Content of Dividends' *Journal of Business* 49 (1976) pp 81-85.

42. Gonedes N.J. 'Corporate Signalling External Accounting and Capital Market Equilibrium: Evidence of dividends, income and extraordinary items,' *Journal of Accounting Research* 16 (1) 1978 pp 26-79.

43. Bhattacharya S, 'Imperfect Information dividend policy, and the bird in the hand fallacy', *Bell Journal of Economics* 10(1) pp 259-271.

equilibrium in an intertemporal setting with an assumption that a firm (all equity firm) should be able to meet its dividend commitment without relying on new financing. In his subsequent studies, Bhattacharya (1980) developed a general 'snapshot' (three-period) nondissipative signaling model with the aid of a particular competitive quote-based labour market example to illustrate the 'uniqueness' and the role of dividends as signal of firms' future earnings prospect.⁴⁴ Ross (1977) also has argued that dividend policy could be viewed as a 'signaling mechanism' whereby firms with profitable projects are able and willing to pay higher dividends in order to segregate themselves from firms with less profitable projects.⁴⁵ He developed an incentive-signaling equilibrium (i.e. the relationship between signaling and the managerial incentive structure) and demonstrated that managers' compensation and bankruptcy risk are linked to the market value of the firm and the managers will not issue 'false' signals (either dividends or leverage) as its costs would be very high.

4.5.5 Earnings and dividend announcements are normally released at the same time and their corroboration effect causes difficulties in making separate or explicit identification between the two.⁴⁶ However, Aharony and Swary (1980) were successful in their effort to measure the two effects separately.⁴⁷ In their empirical study on 149 industrial firms, they developed a dividend expectation model which is applied

44 Bhattacharya S. 'Nondissipative Signaling Structure and Dividend Policy,' *Quarterly Journal of Economics* 95 (1) 1980 pp 1 - 24 .

✓45 Ross, S.A. 'The Determination of Financial Structure: the incentive signaling approach,' *Bell Journal of Economics* 8(1) 1977 pp 23-40.

46 A statistically significant interaction effect and corroborative relationship between the two announcements have been demonstrated by Alex Kane, Young Ki Lee and Alan Marcus in their article 'Earnings and Dividend Announcements: Is there a Corroboration Effect? ', *Journal of Finance* No.4 September 1984 pp 1091 - 1098 .

47 Aharony J. and Swary I., 'Quarterly Dividend and Earnings Announcements and Stockholders' Return ; An Empirical Analysis,' *Journal of Finance* Vol.35 No.1 1980 pp 1 - 12 .

only to shares where cash dividends are announced at least 11 trading days before or after the earnings announcements in the same quarter . They found a significant dividend announcement effect and changes in quarterly cash dividends provide useful information beyond that provided by corresponding earnings announcements.

4.5.6 Kalay (1980) re-examined the existing empirical evidence on the managerial reluctance to cut dividends and he found that only 10 out of the 197 dividend reductions were 'forced' reductions. Therefore he has to accept the hypothesis that dividend reductions convey information.⁴⁸ In another study, Nils Hakansson (1982) demonstrated that in a general consumer-investors equilibrium, dividend announcements have a significant informative 'power' in improving welfare (efficiency) when investors have heterogeneous (non-homogeneous) beliefs or financial markets are incomplete. On the other hand, dividends serve no useful role and to some extent deleterious to efficiency if investors have homogeneous beliefs and the markets are complete and already efficient.⁴⁹

4.5.7 Results from an empirical study by Brickley (1983) are consistent with the information content of dividend hypothesis. Both specially designated dividend (SDD ie labeled dividend, either extra or special dividends) and regular (unlabeled) dividend increases appeared to convey positive information.⁵⁰ The regular dividend increases have a more positive message since the changes in earnings in the subsequent fiscal years after the dividend announcements are statistically larger. Penman

48 Kalay A., 'Signaling, Information Content and the Reluctance to cut dividends,' Journal of Financial and Quantitative Analysis 15 (4), 1980 pp 855 - 869 .

49 Hakansson N.H., 'To pay or not to pay dividends,' Journal of Finance 37 (2) May 1982, pp 415 - 428 .

50 Brickley, James A. 'Shareholder Wealth, Information Signaling and The Specially Designated Dividend,' Journal of Financial Economics, 12, August 1983 pp 187 - 209 .

(1983) also concluded that dividend announcements convey information about management's expectations to the market. However, in his study on the relationship and the role of dividend announcements and earnings forecasts as predictors of earnings and firm's value, he found that for those well established firms with stable dividend payments, the dividend announcements do not function as good predictors compared to the earnings forecasts.⁵¹ Penman's findings are somewhat inconsistent with the findings of Dielman and Oppenheimer (1984). In their study of the impact of large dividend changes on investors' behaviour, they found that the more stable the firm's dividend payment history, the larger the abnormal return due to the changes in investors' expectations as a result of dividend changes announcements.⁵²

4.5.8 The above mentioned studies, even with some disagreement in their findings and conclusions, did provide more evidence relevant to the information content of dividend hypothesis. Since the majority of researchers recognised that dividends contained information and the market reacted to that valuable information, the author, therefore takes the view that the information hypothesis is valid.

51 Penman, Stephen H. 'The Predictive Content of Earnings Forecasts and Dividends,' Journal of Finance, September 1983, 38 pp 1181 - 1199 .

52 Dielman, Terry E. and Oppenheimer, Henry R., 'An Examination of Investor Behaviour During Periods of Large Dividend Changes,' Journal of Financial and Quantitative Analysis Vol.19 No.2 June 1984 pp 197 - 216 .

4.6 The Negative Impact of Dividend Policy:

4.6.1 As mentioned earlier, the leftist group believes that an increase in dividends reduces value - both the value of the firm and the value of the shareholders' wealth. Therefore the firm should adopt a low target payout as not to negatively affect this wealth and value. Their position is actually based on MM's assumptions and arguments to take into account the imperfections and uncertainties in the real world with taxes, flotation and transaction costs.

4.6.2 The focus on the dividend controversy is shifted by the fact that capital gains are taxed at a lower rate than dividends, and the capital gains tax can be deferred. [When a firm pays a large percentage of its earnings as dividends, the shareholders will have to pay a substantial amount of tax which would have been avoided if the firm had retained the earnings.] This suggests a negative wealth impact.

Walter (1967) in his research into the relationship between retained earnings and share prices, has found that the rate of growth of share prices over time is associated with the proportion of earnings retained.⁵³ Growth shares are characterised by low dividend payout ratios and intermediate growth shares are characterised by medium to high payout ratios.

4.6.3 Friend and Puckett (1964) in their study on dividends and stock prices found little basis to support the notion that a dollar of dividends has several times the impact on price of a dollar of retained earnings. Their results indicate that in growth industries, investors (shareholders) place higher valuation on retained earnings.⁵⁴ Another study

53 Walter J.E., 'Dividend Policy and Enterprise Valuation,' Woodsworth, California, 1967.

54 Friend, I. and Puckett M., 'Dividends and Stock Prices,' American Economic Review, 54, June 1964 pp 656-681. According to them, growth industries is characterised by large retained earnings or when retained earnings receive greater relative weight than dividends. In their sample, they considered that chemicals, electronics and utilities as growth industries.

by Higgins (1974) shows a similar result that the market prefers low payout and high retained earnings, even in the electric utility industry, a 'finite-growth' industry.⁵⁵ His test reveals that the dividend coefficient a_5/DA is negative in eight out of nine test years, therefore he concludes that dividends do not increase share prices despite the 'information content' but in fact 'if there is any relationship at all between the variables, it is in the opposite direction.'⁵⁶

4.6.4 The 'leftist' group has accepted the 'clienteles effect' hypothesis. However they maintained that, based on rationality and all other things equal, shareholders, even though those in lower tax brackets tend to prefer low-dividend yield shares. Elton and Gruber (1970) in their study on the price behaviour of ex-dividend shares and by using Spearman's Rank Correlation Coefficient found an inverse relationship between the dividend payout ratio and the implied tax brackets of marginal shareholders (stockholders). The tax bracket in general decreases as the dividend yield increases. They interpret this result as consistent with the clienteles effect where investors in high tax brackets show a preference for capital gains over dividends and vice versa.⁵⁷ Their findings are somewhat consistent to the findings of Blume and Crocket and Friend (1974) and Lewellen et al (1978). Blume, Crocket and Friend found an inverse (mild) relationship between the dividend yields and investors' portfolio tax brackets while Lewellen et al although they found some specialisation along tax

55 Higgins, R. C., 'Growth, Dividend Policy and Capital Costs in the Electric Utility Industry,' *Journal of Finance* 29 (Sept.) 1974 pp 1189 -1201.

56 *Ibid.*, pp 1199 and 1200. a_5 measures the effect on share value of increasing dividends solely at the expense of retained earnings.

57 Elton E. and Gruber M., 'Marginal Stockholder Tax Rates And The Clientele,' *Review of Economics and Statistics*, 63(4) 1970 pp 1132-61

brackets they discovered however a general distribution of shares and an ample representation of investors regardless of their dividend-yield attributes. A comment by Haley and Schall on dividends and financing policies of the firms seems to support the 'general preference' of investors for a low payout. According to them, investors in low-tax brackets (or tax-exempt investors) as well as those in high-tax brackets (income-tax rates) would prefer internal financing (i.e. retained earnings) if the tax differential is large.⁵⁸ A preference for retained earnings is therefore a preference for low dividends.

4.6.5 In the same study, Elton and Gruber (1970) have shown that there was a linkage between a share's dividend yield and the 'drop' in its ex-dividend date price. According to them, if the capital gains tax rate is lower than the tax rate on dividends, the fall from the last cum-dividend day (closing price or P_B) to the first ex-dividend day will be less than the amount of dividend paid. The risk adjusted rate of return on the ex-dividend day (or months) will thus be higher than on non-ex days and months. Their findings are consistent with earlier findings of Campbell and Beranek (1953) and Durand and May (1960). The proponents of this approach state that the price of a share should fall by the amount of the dividends paid and therefore the assets per share should fall by that amount.

4.6.6 The 'leftist' group further argued that a negative wealth impact may result from other costs associated with paying dividends. In addition to the costs of administering a dividend program, the firm may incur transaction and flotation costs when issuing new

58 Haley, Charles W. and Schall, L.D. 1973 'The Theory of Financial Decisions', Mc Graw-Hill Book. p 237 .

shares. According to this group, with a given investment policy and capital structure, an increase in dividends must be funded with new equity and issuing new equity is the most expensive form of financing. Brealey and Myers (1981) offered a clear explanation of equity financing, corporate borrowing and dividend policies. They confirmed that it is more expensive for a corporation to issue stock than the same amount of debt.⁵⁹ When discussing dividend issues, Brealey and Myers openly disclosed their position that they were in the 'leftist group'.⁶⁰ Since there is no clear statistical evidence and a fully convincing theory they concluded that a company should adopt a 'target payout' that is sufficiently low to minimise its reliance on 'external equity' and if possible any surplus funds should be used to repurchase share rather than to pay dividends.

59 Brealey, R. A. and Myers, M., 1981, 'Principles of Corporate Finance,' McGraw Hill Book, p 294. According to them, since the fact that the shareholders are the eventual beneficiaries of the interest tax shield (on debt), therefore debt financing is preferable. p355.

60 Ibid. p 329

CHAPTER 5 : A STUDY ON THE IMPACT OF DIVIDEND
POLICY ON THE VALUE OF THE FIRM.

5.1 INTRODUCTION:

5.1.1 The purpose of this particular study is to further examine the impact of dividend policy on the value of the firm or to be more specific, the effect of dividends on the market price of shares. Based on our earlier assumption that the value of the firm as reflected in share price is a function of its dividends and profitability, this study is therefore to detect and determine whether there exists a 'significant' relationship and interdependencies between dividends and the market price of shares. This study is supposed to provide a test of the irrelevance of dividends hypothesis which states that no one firm will be able to affect its share prices (market value) by changing its dividend policy.

5.2 THE SAMPLE :

5.2.1 In the sample, as in Table 5.2.1 below, there are 50 British firms randomly chosen from the list of the Extel Handbook of Market Leaders.⁶¹ Though randomly chosen, the firms must have at least five years complete records of dividend per share (DPS), earnings per share (EPS), the highest and the lowest prices for each year. As far as the share prices are concerned, the average of these prices (i.e. highest price + lowest price x 0.5) will make up the market price for that particular year. In order to avoid distortion, any discrepancies in prices which might lead to the misinterpretation of results, the author excludes all price adjustments for any subdivision of shares.

61 Extel Handbook of Market Leaders, issue no.6 January 1979, issue no.12 January 1982 and issue no.16 January 1984 - Extel Statistical Services Limited, London.

For example, as in the case of the Plessey Co.PLC.(firm no:36, Appendix A) the 1983 and 1984 share prices were excluded from the whole data because the company has subdivided its 50p into two 25p shares in 1983. All data on DPS, EPS and share prices were collected from the Extel cards, companies annual reports and also from the pages of the Financial Times (FT) London Share Information Services.

TABLE : 5.2.1
FIRMS USED IN THE STUDY.

No:	Name:
1	Associated British Foods PLC.
2	Associated Dairies Group PLC.
3	Associated Paper Industries PLC.
4	BPM Holdings PLC.
5	Beecham Group PLC.
6	Bejam Group PLC.
7	Boots PLC.
8	Brammer PLC.
9	British & Commonwealth Shipping Co.PLC.
10	British Home Stores PLC.
11	Cadbury Schweppes PLC.
12	Chubb & Son PLC.
13	Comet Group PLC.
14	Consolidated Gold Fields PLC.
15	Crest Nicholson PLC.
16	Crown House PLC.
17	The De La Rue Co.PLC.
18	Delta Group PLC.
19	Dixon Group PLC

No:	Name:
20	Glaxo Holdings PLC.
21	Grand Metropolitan PLC.
22	Hawker Siddeley Group PLC.
23	Henderson Group PLC.
24	Imperial Chemical Industries PLC.
25	Inchcape PLC.
26	Initial PLC.
27	Kwik Fit (tyres & Exhausts) Holdings PLC.
28	John Laing PLC.
29	WM.Low & Co.PLC.
30	Lucas Industries PLC.
31	MFI Furniture Group PLC.
32	Mark & Spencer PLC.
33	Nash Industries PLC.
34	Northern Foods PLC.
35	Nurdin & Peacock PLC.
36	Plessey Co.PLC.
37	Ranks Hovis Mc Dougall PLC.
38	J.Sainsbury PLC.
39	W.H.Smith & Son (Holdings) PLC.
40	Sketchley PLC.
41	Tate & Lyle PLC.
42	Tesco PLC.
43	Trafalgar House PLC.
44	Trafford Park Estate PLC.
45	Travis & Arnold PLC.

No:	Name:
46	Turner & Newall PLC.
47	United Bicuits (Holdings) PLC.
48	Whitecroft PLC.
49	Willis Faber PLC.
50	George Wimpey PLC.

5.3 METHODOLOGY :

5.3.1 The methodology used in this study is to some extent similar to the one used by Elton and Gruber (1970) in their study on the relationship between implied tax brackets and dividend yield.⁶² The author^{1/2} is of the opinion that the Spearman Rank Correlation Coefficient (SROC) is the most suitable and practical method to measure the relationship (if any) between payout ratio (PR) and the price-earnings ratio (PE).⁶³ As generally accepted, the application of this non-parametric tests to the null hypothesis (H_0) should produce reasonably reliable results (either

62 Elton J.E. and Gruber M.J 1970 Op.Cit.

63 The price-earnings ratio (PE) expresses the multiple of the last reported earnings that the market is willing to pay for the ordinary shares. It can be calculated by dividing the market price of ordinary shares by the EPS. Faster growing or less risky firms normally have higher PE ratios than either slower growing or riskier firms. When a firm is not highly regarded in the market, it will have a low ratio relative to more favoured firms in the same industry. PR and PE are based on a common denominator (i.e.EPS), therefore it is practical to measure the relationship between the two variables in order to study the impact of dividend on share prices. It is a clear fact that firms with negative EPS (loss per share) will not have meaningful PE ratios. Again, to avoid any misinterpretation, the author eliminated all the negative EPS and PEs from the data.

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significant or otherwise) on the relationship between the two variables. By assuming the null hypothesis that the PR and PE are independent, an SRCC index was computed for each firm in the sample. The SRCC produces three possible values (indexes), indicating observable correlation. The values near +1 indicate a strong positive (perfect) relationship, the values near -1 indicate a strong negative (inverse) relationship, while those near 0 indicate no relationship (independent).

5.3.2 In addition to the individual company's SRCC index, an overall index is computed based on a portfolio analysis of shares. The firms in the sample were divided into five portfolios (10 firms in each portfolio). The payout ratios (PR) and PEs were then re-arranged to be represented by the medians and the means of the medians in order to have a meaningful overall SRCC index.(Table 5.4.4 and Table 5.4.5).

5.3.3 The SRCC index also is computed for each year from 1979 to 1984. These annual indexes will reflect the relationship between the PR and PE for the cross section of firms in the particular year, and will give us a clearer observation of the relationship. Table 5.4.6 is a summary of these annual SRCC indexes while details of its calculation are in Appendix B.

5.4 RESULTS :

5.4.1 A study of the dividend policies of the firms in the sample reveals that the average payout ratio is 38.9% with a standard deviation of 3.04 (Table 5.4.4). This finding is certainly in sharp contrast to the results offered by Ryan in 1974 where he found the average payout ratio was 71.1% and about 60% of the companies in his sample paid out

dividends at the rates between 60% to 90%.⁶⁴ However, the difference in these results may have arisen because the period of study is different. Ryan conducted his studies of the dividend policies of 60 firms for a six-year period between 1965 and 1970 while this study concentrates on the period between 1975 and 1984. For comparison purposes, a Table from Ryan's work is reproduced in Table 5.4.1 showing the payout ratios in British Industry : 1965 - 70. The result of this study is in Table 5.4.2. Time has changed and so has the dividend policy of the firms. One interpretation is that the firms seem to adjust their payout ratios to suit the new economic situations in the 1970s and 1980s, and the majority of them appear to prefer moderate and stable payout ratios. Another observation found the hesitancy of these firms (management) to change dividends in response to short-term fluctuations in earnings. As may be seen in Table 5.4.2, about 64% of the firms in the sample have paid out dividends at the rates (PR) between 30% to 50% and only about 10% have payout rates of 60% and above.

TABLE 5.4.1
Payout Ratios in British Industry : 1965 - 70

Dividends paid out as a proportion of total earnings after tax:	Percentage of companies in the sample:
Less than 0.4	8.3
0.4 and under 0.5	5.0
0.5 and under 0.6	15.0
0.6 and under 0.7	21.7
0.7 and under 0.8	20.0
0.8 and under 0.9	18.3
0.9 and over	11.7

Source: Ryan T.M.(1974), 'Dividend Policy and Market Valuation in British Industry,' Journal of Business Finance and Accounting 1 No.3 p 414.

⁶⁴ Ryan T.M.(1974) Op.Cit pp 415 & 416. He found the average PR was 71.6% with a standard deviation of 23.6

TABLE 5.4.2
Payout Ratios in 50 British Firms : 1975 - 1984

Dividend payout Ratio: ⁺	Number of firms:	Percentage of firms in the sample
Less than 30%	11	22.0
30% and under 40%	22	44.0
40% and under 50%	10	20.0
50% and under 60%	2	4.0
60% and under 70%	3	6.0
70% and above	<u>2</u>	<u>4.0</u>
	50	100.0

+ median of the payout ratios.

5.4.2 A through study is conducted on the SRCC indexes of every firm in the sample. About 74% of the firms (ie 37 firms) exhibited a positive relationship between payout ratios (PR) and the PE, 56% with a strong positive relationship (ie indexes between 0.5 to 1) and 18% with a positive relationship at 5% significant level (ie indexes between 0.2 and 0.5). On the other hand, only 8% or 4 firms in the sample have negative indexes (ie indexes from - 0.2 to - 1) indicating negative (inverse) relationship and about 18% or 9 firms appeared to have very low indexes (ie under ± 0.2) suggesting that there was no relationship at all between the two variables. Results of the study are summarised in Table 5.4.3 below while details on the PR, PE and SRCC computation for each firm are in Appendix A.

TABLE : 5.4.3
Summary of Results of Testing the PR, PE Relationship:

SRCC Index:	Correlation Observation	Percentage of firms in the sample:
0 and under 0.2	no relationship	14.0
0.2 and under 0.5	positive relationship ⁺	18.0
0.5 to 1	strong + ve relationship	56.0
- 0.01 and under - 0.2	no relationship	4.0
- 0.2 and under - 0.5	- ve relationship ⁺	6.0
- 0.5 to - 1	strong - ve relationship	2.0
		100.0
+ significant at 5% level.		

5.4.3 The above results are confirmed by the overall portfolio SRCC index and the annual indexes. The overall portfolio SRCC index (ie 0.9) shows a strong positive relationship between the mean of medians of PR and the mean of medians of PE. A summary of the portfolio combination of shares is in Table 5.4.4 and Table 5.4.5. The annual SRCC indexes also show a positive relationship between the PR and PE, with the exception of the 1984 index. (Table 5.4.6) From 30 observations the index for 1984 0.0537 suggesting no relationship, while other years with larger observation recorded a positive relationship. These results could be interpreted as an indication on the existence of positive relationship between dividends and share prices. However, a careful observation of the above results fail to give us a convincing interpretation on the relationship between the PR and PEs, and thus between the dividend policy and the share prices. The PE ratio is actually not reflecting a true picture of a firm's position, especially when that particular firm maintains a stable dividend. In these circumstances, the PE and PR will be

very high when earnings fall, and low if earnings increase unexpectedly. The majority of the firms in the sample appear to prefer stable dividends in spite of fluctuations in earnings, as mentioned in paragraph 5.4.1, therefore their PE and PR and the relationships found are still questionable. Another factor is risk. Firms with uncertain earnings prospect tend to be conservative and to maintain a low PR. The markets (the investors) recognise this risk and uncertainty and consequently share of these firms are likely to sell at low a PE multiple . Thus the relationship between the PR and PE may not reflect a market preference for dividends but it is rather as a result of the market recognition of risk.

TABLE: 5.4.4

Summary of the portfolio combination of shares

	Mean of Medians of PR	Std Deviation	Mean of Medians of PE	Std Deviation
Portfolio 1	40.1	10.94	12.06	7.25
Portfolio 2	36.9	11.59	11.25	7.87
Portfolio 3	37.6	21.65	9.45	3.60
Portfolio 4	44.4	17.21	12.18	7.56
Portfolio 5	35.9	13.74	8.26	2.72
Mean of means of medians	38.98	3.04	10.64	1.53
SRCC Index	= 0.9			

TABLE : 5.4.5

Portfolio Combination of Shares

PORTFOLIO 1	FIRM'S NUMBER										Mean of Medians	Standard Deviation
	1	2	3	4	5	6	7	8	9	10		
Median of PR	19.5	61.6	30.4	39.1	44.3	44.4	49.3	42.8	30.9	38.2	40.1	10.94
Median of PE	6.56	24.13	6.88	5.09	14.47	15.61	15.0	10.6	8.52	13.75	12.06	7.25
PORTFOLIO 2	11	12	13	14	15	16	17	18	19	20		
Median of PR	37.2	33.3	24.6	39.3	36.0	50.5	32.8	37.8	16.9	61.3	36.9	11.59
Median of PE	6.47	8.25	9.39	9.18	12.44	8.23	11.05	5.42	7.88	34.17	11.25	7.87
PORTFOLIO 3	21	22	23	24	25	26	27	28	29	30		
Median of PR	29.0	24.8	46.2	36.3	50.7	38.0	32.5	15.0	32.95	20.7	37.6	21.65
Median of PE	7.33	7.32	13.77	8.44	13.98	9.34	15.75	4.54	7.15	6.89	9.45	3.60
PORTFOLIO 4	31	32	33	34	35	36	37	38	39	40		
Median of PR	37.2	48.3	43.5	35.8	32.7	35.0	49.2	92.1	27.2	43.2	44.4	17.21
Median of PE	12.48	14.87	5.0	11.03	13.98	7.28	6.49	30.08	8.79	11.81	12.18	7.56
PORTFOLIO 5	41	42	43	44	45	46	47	48	49	50		
Median of PR	29.5	30.1	33.8	65.4	17.8	46.2	36.6	38.0	45.6	15.7	35.9	13.74
Median of PE	4.74	9.15	5.54	13.53	8.23	10.31	7.09	7.01	11.56	5.45	8.26	2.72

TABLE : 5.4.6
Annual SRCC Indexes

Year:	SRCC Index	Correlation	Number of Observations
1979	0.5879	positive relationship	47
1980	0.6765	positive relationship	49
1981	0.6843	positive relationship	47
1982	0.5347	positive relationship	46
1983	0.3548	positive relationship	47
1984	0.0531	no relationship	30

CHAPTER 6 : CONCLUSION

6.1 This study is not an attempt to settle the dispute in the finance literature on the dividend controversy. As mentioned earlier, its purpose is only to shed some light on the issue, compatible to the main purpose of this work to review and examine in detail the impact of dividend on the value of the firm. Based on the above discussion and the results of this study, the author draws a conclusion that the dividend issue is still controversial and unresolved since there is no clear evidence on this matter. Results of this study, to some extent tend to support the positive impact of dividends. However these results cannot be viewed as conclusive evidence of the positive impact of dividends. One reason is that the majority of firms in the sample appear to pursue a stable dividend policy unaffected by short term fluctuations in earnings, and another is that considerations of (risk and uncertainty will also enter into the market judgement of share values.)

Appendix A : Results of Testing the relationship
between PR and PE.

1. ASSOCIATED BRITISH FOODS PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE ^a y
		Highest	Lowest	Average			
1980	3.4	132	83	107.5	16.95	20.1	6.31
1981	3.8	159	115	137	19.438	19.5	7.05
1982	4.3	184	123	153.5	23.401	18.4	6.56
1983	4.7	167.27	125.45	146.4	24.698	19.0	5.93
1984	5.0	204	142	173	22.312	22.4	7.75
						(19.5) ^b	(6.56) ^c

a, PE = $\frac{\text{Average Share Price}}{\text{EPS}}$

b, the median of the Payout Ratios (PR)

c, the median of the PE.

$$\text{Spearman's Rank Correlation Coefficient (SRCC)} = 1 - \frac{6 \sum_{i=1}^n d_i^2}{n(n^2 - 1)}$$

x	20.1	19.5	18.4	19.0	22.4
y	6.31	7.05	5.56	5.93	7.75
Rank x	4	3	1	2	5
Rank y	2	4	3	1	5
d _i	2	1	2	1	0
d _i ²	4	1	4	1	0
Edi ²	= 10				

$$\begin{aligned} \text{SRCC} &= \frac{6 \times 10}{5(5^2 - 1)} = 1 - \frac{60}{120} \\ &= 1 - 0.5 \\ &= 0.5 \rightarrow + \text{ve relationship.} \\ &=== \end{aligned}$$

2. ASSOCIATED DAIRIES GROUP PLC

YEAR	DPS (pence)	SHARE PRICE (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1979	5.0	206.66	125.33	166.0	3.80	131.6	43.68
1980	4.25	206.0	119.25	162.63	5.60	75.9	29.04
1981	3.75	165.0	106.5	135.75	5.72	65.6	23.73
1982	3.0	168.0	87.0	127.5	5.20	57.5	24.52
1983	3.0	158.0	102.0	130.0	6.88	43.6	18.90
1984	3.0	163.0	115.0	139.0	8.92	33.6	15.58
						(61.6)	(24.13)

x	131.6	75.9	65.6	57.7	43.6	33.6
y	43.68	29.04	23.73	24.52	18.90	15.58
Rank x	6	5	4	3	2	1
Rank y	6	5	3	4	2	1
di	0	0	1	1	0	0

$$E d_i^2 = 2$$

$$SRCC = 1 - \frac{6 \times 2}{6(6^2 - 1)} = 1 - \frac{12}{210}$$

$$= 1 - 0.05714$$

$$= 0.9429 \rightarrow \text{strong + ve relationship}$$

=====

3. ASSOCIATED PAPER INDUSTRIES PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	1.55	46.5	13.0	29.8	2.6	59.6	11.46
1877	2.95	52.0	19.5	35.8	10.2	28.9	3.51
1978	3.48	68.0	46.0	57.0	15.9	21.9	3.58
1979	3.65	67.0	35.75	51.4	12.53	29.13	4.1
1980	2.0	44.06	24.0	34.08	2.0	100	17.04
1981	2.4	45.0	28.0	36.5	4.8	50	7.6
1982	3.8	79.0	42.0	60.5	13.2	28.8	12.6
1983	4.2	105.0	59.0	82.0	13.3	31.6	6.17
						(30.4)	(6.88)

x	59.6	28.9	21.9	29.13	100	50	28.8	31.6
y	11.46	3.51	3.58	4.1	17.04	7.6	12.6	6.17
Rank x	7	3	1	4	8	6	2	5
Rank y	6	1	2	3	8	5	7	4
d _i	1	2	1	1	0	1	5	1
d _i ²	1	4	1	1	0	1	25	1
Edi ²	= 34							

$$\begin{aligned}
 SRCC &= 1 - \frac{6 \times 34}{8(8^2 - 1)} = 1 - \frac{204}{504} \\
 &= 1 - 0.40476 \\
 &= 0.5952 \rightarrow + \text{ve relationship} \\
 &=====
 \end{aligned}$$

4. BPM HOLDINGS PLC

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	2.563	35	20	27.5	5.4	47.5	5.09
1977	2.863	48	24	36.0	8.2	34.9	4.39
1978	3.1963	66	45	55.5	13.8	23.2	4.02
1979	4.25	96	60	78.0	23.2	18.3	3.36
1980	5.25	86	67	76.5	28.3	18.6	2.70
1981	5.775	107	68	87.5	14.7	39.3	5.95
1982	5.775	93	66	79.5	0.1	5775	795
1983	5.775	103	73	88.0	2.5	231	35.2
1984	6.25	165	98	131.5	10.0	39.1	8.22
						(39.1)	(5.09)

\bar{x}	47.5	34.9	23.2	18.3	18.6	39.3	5775	231	39.1
\bar{y}	5.09	4.39	4.02	3.36	2.70	5.95	795	35.2	8.22
Rank x	7	4	3	1	2	6	9	8	5
Rank y	5	4	3	2	1	6	9	8	7
d_i	2	0	0	1	1	0	0	0	2
d_i^2	4	0	0	1	1	0	0	0	4
$\sum d_i^2$	= 10								

$$\begin{aligned}
 SRCC &= 1 - \frac{6 \times 10}{8(8^2 - 1)} = 1 - \frac{60}{504} \\
 &= 1 - 0.11905 \\
 &= 0.88095 \rightarrow \text{strong + ve relationship.} \\
 &=====
 \end{aligned}$$

5. BEECHAM GROUP PLC

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1979	5.5	186.75	114	150.38	13.1	41.9	11.48
1980	6.12	180	107	143.50	12.3	49.8	11.67
1981	6.66	231	150	190.5	13.5	49.3	14.11
1982	8.0	410	209	309.5	18.3	43.7	16.91
1983	9.1	423	295	359.0	22.86	39.8	15.70
1984	10.2	390	265	337.5	22.76	44.8	14.83
						(44.3)	(14.47)

x	41.9	49.8	49.3	43.7	39.8	44.8
y	11.48	11.67	14.11	16.91	15.70	14.83
Rank x	2	6	5	3	1	4
Rank y	1	2	3	6	5	4
d _i	1	4	2	3	4	0
d _i ²	1	16	4	9	16	0

$$\sum d_i^2 = 46$$

$$\begin{aligned} \text{SRCC} &= 1 - \frac{6 \times 46}{6(6^2 - 1)} = 1 - \frac{276}{210} \\ &= 1 - 1.3143 \\ &= -0.3143 \longrightarrow \text{- ve relationship} \\ & \text{=====} \end{aligned}$$

6. BEJAM GROUP PLC

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y	
		Highest	Lowest	Average				
1976	2.6	87	49	68	2.98	87.2	22.82	
1977	2.904	84	38.5	56.25	4.44	65.4	12.67	
1978	1.621	78	55	66.5	4.26	38.1	15.61	
1979	2.17	63	47.5	55.25	5.10	42.5	10.83	
1980	2.25	123	55	89	7.88	71.1	11.29	
1981	2.75	117.75	78	97.88	5.33	51.6	18.36	
1982	2.75	177	106	141.5	7.08	38.8	19.99	
1983	3.25	162	121	141.5	8.04	40.4	17.60	
1984	3.75	141	103	122	8.44	44.4	14.45	
						(44.4)	(15.61)	

x	87.2	65.4	38.1	42.5	71.1	51.6	38.8	40.4	44.4
y	22.82	12.67	15.61	10.83	11.29	18.36	19.99	17.60	14.45
Rank x	9	7	1	4	6	6	2	3	5
Rank y	9	3	5	1	2	7	8	6	4
d _i	0	4	4	3	6	1	6	3	1
d _i ²	0	16	16	9	36	1	36	9	1

$$E d_i = 124$$

$$SRCC = 1 - \frac{6 \times 124}{9(9^2 - 1)} = 1 - \frac{744}{720}$$

$$= 1 - 1.0333$$

$$= -0.0333 \rightarrow \text{no relationship.}$$

=====

7. THE BOOTS CO.PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	2.44	149	77	113	16.5	14.8	8.06
1977	2.71	275	113	194	20.2	13.4	9.60
1978	3.03	239	179	209	21.1	14.4	9.91
1979	6.0	238	146	192	12.8	46.9	15.0
1980	7.0	258	155	206.5	13.4	52.2	15.41
1981	6.5	257	186	221.5	13.2	49.3	16.78
1982	8.5	298	189	243.5	12.8	66.4	19.02
1983	9.5	190	109	149.5	13.8	68.8	10.83
1984	5.5	214	140	177	9.07	60.6	19.51
						(49.3)	(15.0)

x	14.8	13.4	14.4	46.9	52.2	49.3	66.4	68.8	60.6
y	8.06	9.6	9.91	15.0	15.41	16.78	19.02	10.83	19.51
Rank x	3	1	2	4	6	5	8	9	7
Rank y	1	2	3	5	6	7	8	4	9
di	2	1	1	1	0	2	0	5	2
di ²	4	1	1	1	0	4	0	25	4
Edi ²	= 40								

$$SRCC = 1 - \frac{6 \times 40}{9(9^2 - 1)} = 1 - \frac{240}{720}$$

$$= 1 - 0.3333$$

$$= 0.6667 \longrightarrow + \text{ve relationship}$$

=====

8. BRAMMER PLC

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1979	5.5	163	109	136	18.9	29.1	7.19
1980	5.5	160	121	140.5	13.9	39.6	10.11
1981	5.7	167	107	137.0	12.4	45.9	11.05
1982	5.9	146	106	126	11.6	50.9	10.86
1983	6.2	171	104	137.5	13.3	46.6	10.34
1984	6.2	286	144	215	18.1	34.3	11.88
						(42.8)	(10.6)

x	29.1	39.6	45.9	50.9	46.6	34.3
y	7.19	10.11	11.05	10.86	10.34	11.88
Rank x	1	3	4	6	5	2
Rank y	1	2	5	4	3	6
d _i	0	1	1	2	2	4
d _i ²	0	1	1	4	4	16
Edi ²	= 26					

$$SRCC = 1 - \frac{6 \times 26}{6(6^2 - 1)} = 1 - \frac{156}{210}$$

$$= 1 - 0.7429$$

$$= 0.2571 \longrightarrow \text{+ve relationship.}$$

9. BRITISH & COMMONWEALTH SHIPPING CO. PIC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1975	7.535	248	80	164	24.4	30.9	6.78
1976	8.289	215	176	195.5	26.3	31.52	7.43
1977	9.118	322	213	267.5	31.4	29.04	8.52
1978	10.2	309	250	279.5	30.2	33.8	9.26
1979	12.5	381	245	313	39.7	31.49	7.88
1980	12.5	375	275	325	37.4	33.4	8.69
1981	13.5	339	259	299	46.5	29.03	6.43
1982	15.5	642	301.8	471.9	55.0	28.2	8.58
1983	17.5	955	585	790	85.1	20.6 (30.9)	17.86 (8.52)

x	30.9	31.52	29.04	33.8	31.49	33.4	29.03	28.2	20.6
y	6.78	7.43	8.52	9.26	7.88	8.69	6.43	8.58	17.86
Rank x	5	7	4	9	5	8	3	2	1
Rank y	2	3	5	8	4	7	1	6	9
di	3	4	1	1	2	1	2	4	8
di ²	9	16	1	1	4	1	4	16	64
Edi ²	= 116								

$$SRCC = 1 - \frac{6 \times 116}{9(9^2 - 1)} = 1 - \frac{696}{720}$$

$$= 1 - 0.9667$$

$$= 0.0333 \rightarrow \text{no relationship}$$

=====

10. BRITISH HOME STORES PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1977	2.87	123.5	67.5	95.3	5.9	48.6	16.15
1978	3.16	115.5	85.5	100.5	6.2	50.9	16.21
1979	3.57	140.5	85.0	112.8	11.0	32.5	10.25
1980	8.75	175	112	143.5	15.0	58.3	9.57
1981	4.5	188	113	150.5	13.5	33.3	11.15
1982	4.75	236	116	176.0	13.0	36.54	13.54
1983	5.25	238	194	216	13.2	39.8	16.36
1984	6.0	277	181	229	16.4	36.59	13.96
						(38.2)	(13.75)

x	48.6	50.9	32.5	58.3	33.3	36.54	39.8	36.59
y	16.15	16.21	10.25	9.57	11.15	13.54	16.36	13.96
Rank x	6	7	1	8	2	3	5	4
Rank y	6	7	2	1	3	4	8	5
di	0	0	1	7	1	1	3	1
di ²	0	0	1	49	1	1	9	1
Edi ²	= 62							

$$SRCC = 1 - \frac{6 \times 62}{8(8^2 - 1)} = 1 - \frac{372}{504}$$

$$= 1 - 0.7381$$

$$= 0.2619 \rightarrow \text{positive + ve relationship.}$$

11. CADBURY SCHWEPPE'S PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	2.73	56	28	42	7.8	35	5.38
1977	3.0	60	34	47	9.3	32.3	5.05
1978	3.24	63	47	55	8.5	38.1	6.47
1979	3.85	70	50	60	10.435	36.89	5.75
1980	4.1	76.5	53	64.8	11.012	37.2	5.88
1981	4.4	102	67	84.5	10.752	40.9	7.86
1982	4.9	133	84	108.5	10.959	44.7	9.90
1983	5.4	133	95	114	12.286	43.9	9.28
1984	5.4	163	115	139	14.627	36.92	9.50
						(37.2)	(6.47)

x	35	32.3	38.1	36.89	37.2	40.9	44.7	43.9	36.92
y	5.38	5.05	6.47	5.75	5.88	7.86	9.9	9.28	9.5
Rank x	2	1	6	3	5	7	9	8	4
Rank y	2	1	5	3	4	6	9	7	8
di	0	0	1	0	1	1	0	1	4
$\sum di^2$	= 20								

$$SRCC = 1 - \frac{6 \times 20}{9(9^2 - 1)} = 1 - \frac{120}{720}$$

$$= 1 - 0.1667$$

$$= 0.8333 \rightarrow \text{strong + ve relationship}$$

=====

12. CHUBB & SON PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1975	2.6832	118	35	76.5	9.50	28.24	8.05
1976	3.1215	125	74	99.5	11.77	26.52	8.45
1977	3.4675	138	92	115.0	18.58	18.66	6.19
1978	3.872	156	109	132.5	17.04	22.72	7.76
1979	5.3415	177	92	134.5	19.36	27.59	6.92
1980	5.425	124	63	93.5	4.94	109.89	18.93
1981	5.425	109	68	88.5	4.17	130.10	21.22
1982	5.425	128	98	113.0	6.65	81.58	16.99
1983	5.95	194	119	156.5	12.04	49.42	12.99
1984	5.95	315	141	228	15.51	38.36	14.70
						(33.3)	(8.25)

x	28.24	26.52	18.66	22.72	27.59	109.89	130.1	81.58	49.42	38.36
y	8.05	8.45	6.19	7.76	6.92	18.93	21.22	16.99	12.99	14.70
Rank x	5	3	1	2	4	9	10	8	7	6
Rank y	4	5	1	3	2	9	10	8	6	7
di	1	2	0	1	2	0	0	0	1	1
di ²	1	4	0	1	4	0	0	0	1	1
Edi ²	= 12									

$$\begin{aligned}
 SRCC &= 1 - \frac{6 \times 12}{10(10^2 - 1)} = 1 - \frac{72}{990} \\
 &= 1 - 0.07272 \\
 &= 0.9273 \rightarrow \text{strong + ve relationship} \\
 &\text{=====}
 \end{aligned}$$

13. COMET GROUP PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	1.0485	58.5	28.5	43.5	1.62	64.72	26.85
1977	1.1715	161	45	103	4.76	24.61	21.64
1978	1.80632	154	99	126.5	7.34	24.61	17.17
1979	5.25	176	94	135	22.8	23.03	5.92
1980	3.81834	123	67	95	15.4	24.79	6.17
1981	4.0	164	96	130	16.6	24.09	7.83
1982	4.4	272	100	186	17.0	25.88	10.94
1983	5.7	365	233	299	39.1	14.58	7.65
						(24.61)	(9.39)

x	64.72	24.61	24.61	23.02	24.79	24.09	25.88	14.58
y	26.85	21.64	17.17	5.92	6.17	7.83	10.94	7.65
Rank x	8	4.5	4.5	2	6	3	7	1
Rank y	8	7	6	1	2	4	5	3
d _i	0	2.5	1.5	1	4	1	2	2
d _i ²	0	6.25	2.25	1	16	1	4	4
E _{d_i} ²	=	34.5						

$$SRCC = 1 - \frac{6 \times 34.5}{8(8^2 - 1)} = 1 - \frac{207}{504}$$

$$= 1 - 0.4107$$

$$= 0.5893 \rightarrow +ve \text{ relationship.}$$

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14. CONSOLIDATED GOLD FIELDS PLC

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1975	6.54	290.5	182	236.25	31.8	20.57	7.43
1976	7.37	224	111	167.5	17.9	41.17	9.36
1977	8.232	241	132	186.5	20.3	40.55	9.19
1978	9.192	208	162	185	24.6	37.37	7.52
1979	13.51	386	175	280.5	37.3	36.22	7.52
1980	22.5	695	389	542	59.2	38.01	9.16
1981	24.5	547	410	478.5	66.4	36.89	7.21
1982	24.5	504	308	406	39.0	62.82	10.41
1983	24.5	647	455	551	30.5	80.33	18.07
1984	24.5	627	463	545	38.2	64.14	14.27
						(39.3)	(9.18)

x	20.57	41.17	40.55	37.37	36.22	38.01	36.89	62.82	80.33	64.14
y	7.43	9.36	9.19	7.52	7.52	9.16	7.21	10.41	18.07	14.27
Rank x	1	7	6	4	2	5	3	8	10	9
Rank y	2	7	6	3.5	3.5	5	1	8	10	9
d _i	1	0	0	0.5	1.5	0	2	0	0	0
d _i ²	1	0	0	0.25	2.25	0	4	0	0	0
Edi ²	7.5									

$$SRCC = 1 - \frac{6 \times 7.5}{10(10^2 - 1)} = 1 - \frac{45}{990}$$

$$= 1 - 0.04545$$

$$= 0.95455 \rightarrow \text{strong + ve relationship.}$$

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15. CREST NICHOLSON PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	1.0	44	18	31	1.65	60.61	18.79
1977	1.08	68	30	49	2.77	38.99	17.69
1978	1.17	90	64	77	4.75	24.63	16.21
1979	4.09	139	74	106.5	7.56	54.10	14.09
1980	4.6	111	78	94.5	11.93	38.56	7.08
1981	2.85	90	51.5	70.75	8.76	32.53	8.08
1982	3.15	118	80	99	10.15	31.03	9.75
1983	3.35	134	82	108	10.01	33.47	10.79
						(36.0)	(12.44)

x	60.61	38.99	24.63	54.10	38.56	32.53	31.03	33.47
y	18.79	17.69	16.21	14.09	7.08	8.08	9.75	10.79
Rank x	8	6	1	7	5	3	2	4
Rank y	8	7	6	5	1	2	3	4
d _i	0	1	5	2	4	1	1	0
d _i ²	0	1	25	4	16	1	1	0
Ed _i ²	= 48							

$$\begin{aligned}
 SRCC &= 1 - \frac{6 \times 48}{8(8^2 - 1)} = 1 - \frac{288}{504} \\
 &= 1 - 0.57143 \\
 &= 0.42857 \rightarrow + \text{ve relationship.} \\
 &=====
 \end{aligned}$$

16. CROWN HOUSE PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	2.68	60	34	47	4.4	60.91	10.68
1977	4.24	54	33.22	43.61	5.3	80.0	8.23
1978	3.38	66	45.5	55.75	6.7	50.45	8.32
1979	4.5	85.5	56	70.75	13.2	34.09	5.36
1980	5.25	72	54	63	11.7	44.87	5.38
1981	5.25	76.5	53.5	65	25.7	20.43	2.53
1982	5.25	82.75	63	72.88	5.1	102.94	14.29
1983	5.75	105	63	84	10.8	53.24	7.78
1984	6.4	139	99	119	13.2	48.48	9.02
						(50.45)	(8.23)

x	60.91	80.0	50.45	34.09	44.87	20.43	102.94	53.24	48.48
y	10.68	8.23	8.32	5.36	5.38	2.53	14.29	7.78	9.02
Rank x	7	8	5	2	3	1	9	6	4
Rank y	8	5	6	2	3	1	9	4	7
d _i	1	3	1	0	0	0	0	2	3
d _i ²	1	9	1	0	0	0	0	4	9
Edi ²	= 24								

$$SRCC = 1 - \frac{6 \times 24}{9(9^2 - 1)} = 1 - \frac{144}{720}$$

$$= 1 - 0.2$$

$$= 0.8 \rightarrow \text{strong + ve relationship}$$

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17. THE DE LA RUE CO. PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1978	10.02	499	225	362	54.5	18.39	6.64
1979	11.37	557	320	438.5	51.3	22.16	8.55
1980	19.8	905	530	717.5	60.3	32.84	11.90
1981	21.0	800	597	698.5	77.4	27.13	9.02
1982	22.08	748	438	593	35.3	62.55	16.80
1983	23.5	677	520	598.5	48.0	48.96	12.47
1984	25.0	790	560	675	61.1	40.92	11.05
						(32.84)	(11.05)

x	18.39	22.16	32.84	27.13	62.55	48.96	40.92
y	6.64	8.55	11.90	9.02	16.80	12.47	11.05
Rank x	1	2	4	3	7	6	5
Rank y	1	2	5	3	7	6	4
d _i	0	0	1	0	0	0	1

$$E d_i^2 = 2$$

$$SRCC = 1 - \frac{6 \times 2}{7(7^2 - 1)} = 1 - \frac{12}{336}$$

$$= 1 - 0.0357$$

$$= 0.9643 \rightarrow \text{strong + ve relationship.}$$

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18. DELTA GROUP PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	3.29	74	35.5	54.75	10.2	32.25	5.37
1977	5.01	82.5	46.5	64.5	11.8	42.46	5.47
1978	5.44	83	66.5	74.75	16.7	32.57	4.48
1979	6.0	86.5	48	67.25	18.091	33.17	3.72
1980	3.64	68	41.5	54.75	6.895	52.79	7.94
1981	3.64	64	35	49.5	0.68	535.3	72.79
1982	3.40	54.5	38.5	46.5	5.591	60.81	8.32
1983	3.75	69	41	55	13.532	27.71	4.06
						(37.8)	(5.42)

x	32.25	42.46	32.57	33.17	52.79	535.3	60.81	27.71
y	5.37	5.47	4.48	3.72	7.94	72.79	8.32	4.06
Rank x	2	5	3	4	6	8	7	1
Rank y	4	5	3	1	6	8	7	2
di	2	0	0	3	0	0	0	1
di ²	4	0	0	9	0	0	0	1
Edi ²	= 14							

$$SRCC = 1 - \frac{6 \times 14}{8(8^2 - 1)} = 1 - \frac{84}{504}$$

$$= 1 - 0.1667$$

$$= 0.8333 \rightarrow +ve \text{ relationship.}$$

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19. DIXONS GROUP PLC

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1977	1.66	135	46	90.5	15.6	10.64	5.80
1978	1.824	132	92.3	112.15	16.4	11.12	6.84
1979	2.76	129.8	81	105.4	19.1	14.45	5.52
1980	3.325	142	89	115.5	18.6	17.88	6.21
1981	3.49	190.5	113	151.8	17.0	20.53	8.93
1982	3.78	263	153	208	20.3	18.62	10.25
1983	4.09	255	178	216.5	23.8	17.18	9.08
1984	5.0	575	215	395	29.8	16.78	13.26
						(16.9)	(7.88)

x	10.64	11.12	14.45	17.88	20.53	18.62	17.18	16.78
y	5.8	6.84	5.52	6.21	8.93	10.25	9.08	13.26
Rank x	1	2	3	6	8	7	5	4
Rank y	2	4	1	3	5	7	6	8
di	1	2	2	3	3	0	1	4
di ²	1	4	4	9	9	0	1	16
Edi ²	= 44							

$$SRCC = 1 - \frac{6 \times 44}{8(8^2 - 1)} = 1 - \frac{264}{504}$$

$$= 1 - 0.5238$$

$$= 0.4762 \rightarrow + \text{ve relationship.}$$

20. GLAXO HOLDINGS PLC.

YEAR	SHARE PRICES (pence)				EPS (pence)	PR(%) x	PE y
	DPS (pence)	Highest	Lowest	Average			
1977	5.11	668	394	531	12.3	41.54	43.17
1978	5.7	652	503	577.5	12.3	87.88	46.95
1979	16.0	621	390	505.5	10.7	149.5	47.24
1980	9.5	270	180	225	12.3	77.24	18.29
1981	11.25	445	241	343	17.9	62.85	19.16
1982	14.0	1520	414	967	23.4	59.83	41.32
1983	9.0	1080	622.5	851.25	31.5	28.57	27.02
1984	13.0	1100	700	900	45.8	28.38	19.65
						(61.3)	(34.17)

x	41.54	87.88	149.5	77.24	62.85	59.83	28.57	28.38
y	43.17	46.95	47.24	18.29	19.16	41.32	27.02	19.65
Rank x	3	7	8	6	5	4	2	1
Rank y	6	7	8	1	2	5	4	3
di	3	0	0	5	3	1	2	2
di ²	9	0	0	25	9	1	4	4
E di ²	= 52							

$$SRCC = 1 - \frac{6 \times 52}{8(8^2 - 1)} = 1 - \frac{312}{504}$$

$$= 1 - 0.61905$$

$$= \underline{0.38095} \rightarrow +ve \text{ relationship.}$$

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21. GRAND METROPOLITAN PLC

YEAR	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y	
	DPS (pence)	Highest	Lowest				Average
1976	3.83	89	40	64.5	8.6	44.53	
1977	4.21	109.5	61	85.3	11.7	35.98	
1978	4.55	123	86	104.5	17.7	25.71	
1979	5.75	181.5	111	146.3	21.2	27.12	
1980	6.625	169	118.5	143.8	22.7	29.19	
1981	7.25	239	137	188	25.5	28.43	
1982	8.38	317	175	246	27.3	30.69	
1983	9.63	368	295	331.5	33.4	28.83	
						(29.0)	(7.33)

x	44.53	35.98	25.71	27.12	29.19	28.43	30.69	28.83
y	7.5	7.29	5.90	6.90	6.33	7.37	9.01	9.93
Rank x	8	7	1	2	5	3	6	4
Rank y	6	4	1	3	2	5	7	8
d _i	2	3	0	1	3	2	1	4
d _i ²	4	9	00	1	9	4	1	16
Edi ²	= 44							

$$SRCC = 1 - \frac{6 \times 44}{8(8^2 - 1)} = 1 - \frac{264}{504}$$

$$= 1 - 0.5238$$

$$= 0.4762 \rightarrow + \text{ve relationship}$$

=====

22. HAWKER SIDDELEY GROUP PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1977	4.119	215	111.5	163.25	26.1	15.78	6.25
1978	7.27	272	164	218	26.6	27.33	14.45
1979	8.0	274	148	211	32.2	24.84	6.55
1980	8.2	270	156	213	35.2	23.29	6.05
1981	9.3	357	230	293.5	40.1	23.19	7.32
1982	9.8	370	288	329	38.9	25.19	8.46
1983	11.0	407	268	337.5	43.0	25.58	7.85
						(24.8)	(7.32)

x	15.78	27.33	24.84	23.29	23.19	25.19	25.58
y	6.25	14.45	6.55	6.05	7.32	8.46	7.85
Rank x	1	7	4	3	2	5	6
Rank y	2	7	3	1	4	6	5
d _i	1	0	1	2	2	1	1
d _i ²	1	0	1	4	4	1	1
Edi ²	= 12						

$$SRCC = 1 - \frac{6 \times 12}{7(7^2 - 1)} = 1 - \frac{72}{336}$$

$$= 1 - 0.21429$$

$$= 0.78571 \rightarrow +ve \text{ relationship.}$$

23. THE HANDERSON GROUP PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1980	8	154.5	83.2	118.85	11.7	68.4	10.16
1981	8	165	113	139	5.7	140.4	24.39
1982	10	275	126	200.5	10.4	96.2	19.28
1983	12	205	89.3	147.17	11.1	108.1	13.26
1984	5	280	180	230	16.7	29.9	13.77
						(96.2)	(13.77)

x	68.4	140.4	96.2	108.1	29.9
y	10.16	24.39	19.28	13.26	13.77
Rank x	2	5	3	4	1
Rank y	1	5	4	2	3
d _i	1	0	1	2	2
d _i ²	1	0	1	4	4
Edi ²	= 10				

$$SRCC = 1 - \frac{6 \times 10}{5(5^2 - 1)} = 1 - \frac{60}{120}$$

$$= 1 - 0.5$$

$$= 0.5 \rightarrow + \text{relationship.}$$

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24. IMPERIAL CHEMICAL INDUSTRIES PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1975	11.64	335	115	225	34.5	33.7	6.25
1976	14.78	412	254	333	54.4	27.2	6.12
1977	16.52	446	320	383	45.4	36.3	8.44
1978	18.47	426	323	374.5	53.6	34.5	7.01
1979	23.0	423	313	368	74.7	30.8	4.93
1980	17.0	409	314	361.5	22.1	76.9	16.36
1981	19.0	332	224	278	32.3	58.8	8.61
1982	19.0	364	266	315	24.2	78.5	13.02
1983	24.0	662	343	502.5	56.3	42.6	8.93
						(36.3)	(8.44)

x	33.7	27.2	36.3	34.5	30.8	76.9	58.8	78.5	42.6
y	6.52	6.12	8.44	7.01	4.93	16.36	8.61	13.02	8.93
Rank x	3	1	5	4	2	8	7	9	6
Rank y	3	2	5	4	1	9	6	8	7
di	0	1	0	0	1	1	1	1	1
$\sum di^2$	= 6								

$$SRCC = 1 - \frac{6 \times 6}{9(9^2 - 1)} = 1 - \frac{36}{720}$$

$$= 1 - 0.05$$

$$= 0.95 \rightarrow \text{strong + ve relationship.}$$

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25. INCHCAPE PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	7.514	457	270	363.5	22.51	33.4	16.15
1977	12.275	430	290	360	42.52	28.9	8.47
1978	14.0	447	298	372.5	40.7	34.4	9.15
1979	16.5	350	255	488.75	20.2	81.7	24.19
1980	18.15	505	305	405	43.1	42.1	9.39
1981	18.15	478	245	361.5	30.6	59.3	11.81
1982	18.15	348	233	290.5	12.1	150	24.01
1983	18.15	359	246	302.5	13.2	137.5	22.92
						(50.7)	(13.98)

x	33.4	28.9	34.4	81.7	42.1	59.3	150	137.5
y	16.15	8.47	9.15	24.19	9.39	11.81	24.01	22.92
Rank x	2	1	3	6	4	5	8	7
Rank y	5	1	2	8	3	4	7	6
di	3	0	1	2	1	1	1	1
di ²	9	0	1	4	1	1	1	1
Edi ²	= 18							

$$SRCC = 1 - \frac{6 \times 18}{8(8^2 - 1)} = 1 - \frac{108}{504}$$

$$= 1 - 0.21429$$

$$= 0.78571 \rightarrow +ve \text{ relationship.}$$

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26. INITIAL PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1975	3.374347	58.5	18.16	38.33	6.3	53.6	6.08
1976	3.68305	66.5	35	50.75	6.0	61.4	8.46
1977	4.0983	74.5	46	60.25	6.7	61.2	8.99
1978	4.57467	96	63	79.5	13.2	34.7	6.02
1979	5.5	147	88	117.5	17.2	31.9	6.83
1980	7.5	243	187	215	21.0	35.7	10.24
1981	9.0	253	181	217	22.4	40.2	9.69
1982	10.75	362	233	297.5	28.6	37.6	10.40
1983	12.75	498	342	420	34.7	36.7	12.10
1984	14.25	515	363	439	37.1	38.4	11.83
						(38.0)	(9.34)

x	53.6	61.4	61.2	34.7	31.9	35.7	40.2	37.6	36.7	38.4
y	6.08	8.46	8.99	6.02	6.83	10.24	9.69	10.4	12.1	11.83
Rank x	8	10	9	2	1	3	7	5	4	6
Rank y	2	4	5	1	3	7	6	8	10	9
d _i	6	6	4	1	2	4	1	3	6	3
d _i ²	36	36	16	1	4	16	1	9	36	9

$$E d_i^2 = 164$$

$$SRCC = 1 - \frac{6 \times 164}{10(10-1)} = 1 - \frac{984}{990}$$

$$= 1 - 0.9939$$

$$= 0.0061 \rightarrow \text{no relationship.}$$

=====

27. KWIK - FIT (TYRES & EXHAUSTS) HOLDINGS PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1977	0.49	51	16	33.5	1.43	34.3	23.43
1978	0.69	57.2	37.14	47.3	2.85	24.2	16.67
1979	0.78	70	45	57.5	4.64	16.8	12.39
1980	1.34	97.27	50.45	73.9	4.50	29.7	16.42
1981	1.5	113.2	64	88.6	3.96	37.9	22.37
1982	1.364	62	36	49	3.25	41.9	15.08
1983	1.5	62	36	49	3.65	41.1	13.42
1984	1.5686	54	28	41	5.12	30.6	8.01
						(32.5)	(15.75)

x	34.3	24.2	16.8	29.7	37.9	41.9	41.1	30.6
y	23.43	16.67	12.39	16.42	22.37	15.08	13.42	8.01
Rank x	5	2	1	3	6	8	7	4
Rank y	8	6	2	5	7	4	3	1
d _i	3	4	1	2	1	4	4	3
d _i ²	9	16	1	4	1	16	16	9
Ed _i ²	= 72							

$$\begin{aligned}
 SRCC &= 1 - \frac{6 \times 72}{8(8^2 - 1)} = 1 - \frac{432}{504} \\
 &= 1 - 0.85714 \\
 &= 0.14286 \longrightarrow \text{no relationship.} \\
 &=====
 \end{aligned}$$

28. JOHN LAING PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1978	2.4355	85	72	78.5	16.2	15.0	4.85
1979	1.975	84	45	64.5	14.2	13.9	4.54
1980	1.975	60	32	46	5.4	36.6	8.52
1981	1.975	63	35	49	14.7	13.4	3.33
1982	1.975	90	47	68.5	- 4.5	-	-
1983	5.0	180	60	120	26.6	18.8	4.51
						(15.0)	(4.54)

x	15.0	13.9	36.6	13.4	18.8
y	4.85	4.54	8.52	3.33	4.51
Rank x	3	2	5	1	4
Rank y	4	3	5	1	2
d _i	1	1	0	1	2
d _i ²	1	1	0	1	4
E _{d_i}	= 7				

$$SRCC = \frac{6 \times 7}{5(5^2 - 1)} = 1 - \frac{42}{120}$$

$$= 1 - 0.35$$

$$= 0.65 \rightarrow + \text{ve relationship.}$$

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29. WM.LOW & CO. PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1975	4.695	138	61.5	99.75	8.31	56.5	12.00
1976	4.9	106	58	82	6.05	80.9	13.55
1977	5.473	132	74	103	18.07	30.3	5.70
1978	6.1115	126	89	107.5	15.10	40.5	7.12
1979	7.0	138	93	115	20.70	33.8	5.56
1980	7.5	153	113	133	23.74	31.6	5.60
1981	7.5	185	144	164.5	21.49	34.9	7.65
1982	8.0	216	160	188	29.14	27.5	6.45
1983	8.6	316	195	255.5	35.57	24.2	7.18
1984	10.0	522	314	418	31.15	32.1	13.24
						(32.95)	(7.15)

x	56.5	80.9	30.3	40.5	33.8	31.6	34.9	27.5	24.2	32.1
y	12.00	13.55	5.70	7.12	5.56	5.60	7.65	6.45	7.18	13.24
Rank x	9	10	3	8	6	4	7	2	1	5
Rank y	8	10	3	5	1	2	7	4	6	9
d _i	1	0	0	3	5	2	0	2	5	4
d _i ²	1	0	0	9	25	4	0	4	25	16
$\sum d_i^2 = 84$										

$$SRCC = 1 - \frac{6 \times 84}{10(10^2 - 1)} = 1 - \frac{504}{990}$$

$$= 1 - 0.5091$$

$$= 0.4909 \rightarrow +ve \text{ relationship.}$$

=====

30. LUCAS INDUSTRIES PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	(PR(%)) x	PE y
		Highest	Lowest	Average			
1976	7.3	234	133	183.5	36.30	20.1	5.06
1977	8.1	339	200	269.5	39.14	20.7	6.89
1978	9.04	337	238	287.5	59.89	15.1	4.80
1979	11.0	314	193	253.5	54.30	20.3	4.67
1980	11.0	268	163	215.5	27.23	40.4	7.91
1981	11.0	241	155	198.0	-38.60	-	-
1982	8.6	240	119	179.5	4.10	209.8	43.78
1983	8.6	180	119	152.5	-13.5	-	-
1984	8.6	180	125	221.0	17.80	48.3	12.42
						(20.7)	(6.89)

x	20.1	20.7	15.1	20.3	40.4	209.8	48.3
y	5.06	6.89	4.80	4.67	7.91	43.78	12.42
Rank x	2	4	1	3	5	7	6
Rank y	3	4	2	1	5	7	6
di	1	0	1	2	0	0	0
Edi ²	= 8						

$$SRCC = 1 - \frac{6 \times 8}{7(7^2 - 1)} = 1 - \frac{48}{336}$$

$$= 1 - 0.14286$$

$$= 0.85714 \rightarrow +ve \text{ relationship.}$$

=====

31. MFI FURNITURE GROUP PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1979	2.196	90	58	74	7.98	27.5	9.27
1980	2.62	90	44	67	9.44	27.8	7.10
1981	2.62	70	44	57	5.86	44.7	9.73
1982	2.8	153	54	103.5	6.12	45.8	26.64
1983	3.7	168	126	147	9.49	38.9	15.49
1984	4.6	265	130	197.5	12.97	35.5	15.23
						(37.2)	(12.48)

x	27.5	27.8	44.7	45.8	38.9	35.5
y	9.27	7.10	9.73	26.64	15.49	15.23
Rank x	1	2	5	6	4	3
di	1	1	2	0	1	1
di ²	1	1	4	0	1	1
Edi ²	= 8					

$$\begin{aligned}
 \text{SRCC} &= 1 - \frac{6 \times 8}{6(6^2 - 1)} = 1 - \frac{48}{210} \\
 &= 1 - 0.22857 \\
 &= 0.77143 \longrightarrow + \text{relationship} \\
 &\text{*****}
 \end{aligned}$$

32. MARK & SPENCER PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1977	2.0461	174	93	133.5	6.2	33.0	21.53
1978	2.2309	95	66.75	80.88	7.7	28.9	10.50
1979	2.66	137.5	75	106.3	9.7	27.4	10.96
1980	3.4	122	75	98.5	7.21	47.2	13.66
1981	4.8	144	101	122.5	7.62	62.9	16.08
1982	4.6	239	122	180.5	9.22	49.9	19.58
1983	5.1	230	185	207.5	10.3	49.5	20.15
1984	6.25	135	99	117	12.6	49.6	9.29
						(48.3)	(14.87)

x	33.0	28.9	27.4	47.2	62.9	49.9	49.9	49.6
y	21.53	10.5	10.96	13.66	16.08	19.58	20.15	9.29
Rank x	3	2	1	4	8	7	5	6
Rank y	8	2	3	4	5	6	7	1
d _i	5	1	2	0	3	1	2	5
d _i ²	25	1	4	0	9	1	4	25
Ed _i ²	= 69							

$$SRCC = 1 - \frac{6 \times 69}{8(8^2 - 1)} = 1 - \frac{414}{504}$$

$$= 1 - 0.8214$$

$$= 0.1786 \rightarrow \text{no relationship.}$$

=====

33. NASH INDUSTRIES PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1979	6.5	94.5	65	78.75	9.9	65.7	7.95
1980	6.5	74	50	62	6.5	100	9.54
1981	4.0	59	28	43.5	11.3	35.4	3.85
1982	4.0	55	37	46	9.2	43.5	5.0
1983	4.0	68	42	55	10.9	36.7	4.73
						(43.5)	(5.0)

x	65.7	100	35.4	43.5	36.7
y	7.95	9.54	3.85	5.0	4.73
Rank x	4	5	1	3	2
Rank y	4	5	1	3	2
d _i	0	0	0	0	0
$\sum d_i^2$	= 0				

$$SRCC = 1 - \frac{6 \times 0}{5(5^2 - 1)}$$

$$= 1 - 0$$

$$= 1 \longrightarrow \text{perfect + ve relationship}$$

34. NORTHERN FOOD PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1975	1.5002	91	18	54.5	4.40	34.1	12.39
1976	3.3	85.5	42.5	64	5.57	59.2	11.49
1977	1.8429	125	63	94	6.61	27.9	14.22
1978	3.0003	118	72	95	10.17	29.5	9.34
1979	4.5	142	98	120	10.42	43.2	11.52
1980	5.5	166	107	136.5	12.78	43.0	10.68
1981	5.0	195	125	160	14.71	33.9	10.88
1982	5.75	204	134	169	16.23	35.4	10.41
1983	5.92	206	158	182	16.30	36.3	11.17
1984	9.0	214	160	187	18.72	48.1	9.99
						(35.8)	(11.03)

x	34.1	59.2	27.9	29.5	43.2	43.0	33.9	35.4	36.3	48.1
y	12.39	11.49	14.22	9.34	11.52	10.68	10.88	10.41	11.17	9.99
Rank x	4	10	1	2	8	7	3	5	6	9
Rank y	9	7	10	1	8	4	5	3	6	2
d _i	5	3	9	1	0	3	2	2	0	7
d _i ²	25	9	81	1	0	9	4	4	0	49
Ed _i ²	= 182									

$$SRCC = 1 - \frac{6 \times 182}{10(10^2 - 1)} = 1 - \frac{1092}{990}$$

$$= 1 - 1.10303$$

$$= -0.10303 \longrightarrow \text{no relationship.}$$

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35. NURDIN & PEACOCK PLC

YEAR	DPS (pence)	SHARE PRICE (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1975	1.5	97	25	61	2.5	60	24.4
1976	3.3	100	69	84.5	3.4	97	24.85
1977	1.8429	123	45.5	84.25	4.5	40.9	18.72
1978	1.004	109	70	89.5	7.4	13.6	12.10
1979	3.6	133	76	104.5	11.0	32.7	9.5
1980	4.5	228	108	168	10.1	44.6	16.63
1981	2.7	150	94	122	11.0	24.5	11.1
1982	3.12	186	130	158	11.3	27.6	13.98
1983	3.57	190	124	157	13.8	25.9	11.38
						(32.7)	(13.98)

x	60	97	40.9	13.6	32.7	44.6	24.5	27.6	25.9
y	24.4	24.85	18.72	12.1	9.5	16.63	11.1	13.98	11.38
Rank x	8	9	7	1	5	6	2	4	3
Rank y	8	9	7	4	1	6	2	5	3
di	0	0	0	3	4	0	0	1	0
di ²	0	0	0	9	16	0	0	1	0
Edi ²	= 26								

$$SRCC = 1 - \frac{6 \times 26}{9(9^2 - 1)} = 1 - \frac{156}{720}$$

$$= 1 - 0.2167$$

$$= 0.7833 \rightarrow +ve \text{ relationship.}$$

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36. PLESSEY CO. PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1975	3.9	90	37	63.5	15.0	26.0	4.23
1976	4.4	87	44	65.5	14.3	30.8	4.55
1977	4.99	118	60.5	89.25	13.1	38.1	6.81
1978	5.49	127	87	107	15.2	36.1	7.04
1979	6.3	135	101	118	15.7	40.1	7.52
1980	6.94	285	104	194.5	16.7	41.6	11.65
1981	7.63	403	248	325.5	22.53	33.9	14.45
1982	8.61	657	342	499.5	29.31	29.4	17.02
1983	6.015	257.3 ⁺	174 ⁺	215.7	11.33	53.2	19.05
1984	3.801	248	188	218	15.25	24.9	14.29
						(35.0)	(7.28)

+ The price was adjusted for subdivision of shares and scrip issue.

x	26.0	30.8	38.1	36.1	40.1	41.6	33.9	29.4
y	4.3	4.55	6.81	7.04	7.52	11.65	14.45	17.02
Rank x	1	3	6	5	7	8	4	2
Rank y	1	2	3	4	5	6	7	8
d _i	0	1	3	1	2	2	3	6
d _i ²	0	1	9	1	4	4	9	36
E d _i ²	= 64							

$$SRCC = 1 - \frac{6 \times 64}{8(8^2 - 1)} = 1 - \frac{384}{504}$$

$$= 1 - 0.7619$$

$$= 0.2381 \rightarrow +ve \text{ relationship.}$$

=====

37. RANKS HOVIS Mc DOUGALL PLC.

YEAR	DPS (pence)	SHARE PRICE (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	3.035	57	29	43	6.2	48.9	6.94
1977	3.338	56	37	46.5	5.7	58.6	8.16
1978	3.42	62	44	53	5.3	64.5	10.0
1979	3.573	53	40.5	46.75	7.2	49.6	6.5
1980	3.645	51.5	40.5	46	7.1	51.3	6.48
1981	3.857	72	46.5	59.25	11.2	34.4	5.30
1982	3.857	70	46.5	58.25	9.0	42.9	6.47
1983	3.974	79	50.5	64.75	10.9	36.5	5.94
						(49.2)	(6.49)

x	48.9	58.6	64.5	49.6	51.3	34.4	42.9	36.5
y	6.94	8.16	10.0	6.5	6.48	5.30	6.47	5.94
Rank x	4	7	8	5	6	1	3	2
Rank y	6	7	8	5	4	1	3	2
di	2	0	0	0	2	0	0	0
Edi ²	= 8							

$$SRCC = 1 - \frac{6 \times 8}{8(8^2 - 1)} = 1 - \frac{48}{504}$$

$$= 1 - 0.09524$$

$$= 0.90476 \rightarrow \text{strong + ve relationship.}$$

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38. SAINSBURY PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1975	4.5	186	79	132.5	2.11	213	62.79
1976	4.9	144	93	118.5	2.23	219	53.14
1977	5.39	255	131	193	3.77	143	51.19
1978	6.0202	243	158	200.5	6.34	94.9	31.62
1979	7.12	352	222	287	7.96	89.4	36.06
1980	10.25	367	140	253.5	10.55	97.2	24.03
1981	9.5	510	330	420	14.71	64.6	28.55
1982	9.75	457	247.5	352.3	20.16	48.4	17.48
1983	5.85	470	353	411.5	23.22	25.2	17.72
1984	7.5	310	227	268.5	25.78	29.1	10.42
						(92.1)	(30.08)

x	213	219	143	94.4	89.4	97.2	64.6	48.4	25.2	29.1
y	62.79	53.14	51.19	31.62	36.06	24.03	28.55	17.48	17.72	10.42
Rank x	9	10	8	6	5	7	4	3	1	2
Rank y	10	9	8	6	7	4	5	2	3	1
di	1	1	0	0	2	3	1	1	2	1
di ²	1	1	0	0	4	9	1	1	4	1
Edi ²	= 22									

$$SRCC = 1 - \frac{6 \times 22}{10(10^2 - 1)} = 1 - \frac{132}{990}$$

$$= 1 - 0.13333$$

$$= 0.8667 \rightarrow \text{strong + ve relationship.}$$

39. W, H. SMITH & SON (HOLDINGS) PLC.

SHARE PRICES
(pence)

YEAR	DPS (pence)				EPS (pence) Y	PR(%) x	PE y
		Highest	Lowest	Average			
1977	1.9813	166	67.2	116.6	13.7	14.5	8.51
1978	2.1793	192	137	164.5	20.6	10.6	7.99
1979	3.1104	204	129	166.5	23.1	13.5	7.21
1980	4.2	165	129	147	16.2	25.9	9.07
1981	4.6	187	132	159.5	12.3	37.4	12.97
1982	4.25	306	147	226.5	14.9	28.5	15.20
1983	6.0	148	112	130	17.3	34.7	7.51
1984	5.6	176	118	147	14.58	38.4	10.08

(27.2) (8.79)

x	14.5	10.6	13.5	25.9	37.4	28.5	34.7	38.4
y	8.51	7.99	7.21	9.07	12.97	15.2	7.51	10.08
Rank x	3	1	2	4	7	5	6	8
Rank y	4	3	1	5	7	8	2	6
d _i	1	2	1	1	0	3	4	2
d _i ²	1	4	1	1	0	9	16	4
E d _i ²	= 36							

$$SRCC = \frac{6 \times 36}{8(8^2 - 1)} = 1 - \frac{216}{504}$$

$$= 1 - 0.4286$$

$$= 0.5714 \rightarrow +ve \text{ relationship.}$$

40. SKETCHLEY PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	3.8	70.5	47	58.75	6.9	55.1	8.51
1977	4.24	107.5	55	81.25	7.0	60.6	11.61
1978	4.46	145	95.5	120.25	12.0	37.2	10.02
1979	5.49	212	142	177	14.9	36.8	11.88
1980	8.0	289	201	245	36.0	22.2	6.81
1981	9.0	290	237	263.5	18.7	48.1	14.09
1982	10.5	395	237	316	26.0	40.4	12.15
1983	12.0	426	362	394	27.4	43.8	14.38
1984	14.0	419	346	382.5	32.4	43.2	11.81
						(43.2)	(11.81)

x	55.1	60.6	37.2	36.8	22.2	48.1	40.4	43.8	43.2
y	8.51	11.61	10.02	11.88	6.81	14.09	12.15	14.38	11.81
Rank x	8	9	3	2	1	7	4	6	5
Rank y	2	4	3	6	1	8	7	9	5
di	6	5	0	4	1	1	3	3	0
di ²	36	25	0	16	1	1	9	9	0
Edi ² =	97								

$$SRCC = 1 - \frac{6 \times 97}{9(9^2 - 1)} = 1 - \frac{582}{720}$$

$$= 1 - 8083$$

$$= 0.1917 \rightarrow \text{no relationship.}$$

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41. TATE & LYLE PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	11.8	295	190	242.5	66.4	17.8	3.65
1977	13.14	286	186	236	49.2	26.7	4.79
1978	10.45	220	162	191	20.8	50.2	9.18
1979	10.5	192	125	158.5	25.1	41.8	6.31
1980	10.5	180	114	147	31.3	33.5	4.69
1981	11.5	200	126	163	37.2	30.9	4.38
1982	13.5	230	157	193.5	48.0	28.1	4.03
1983	16.0	410	222	316	59.5	26.9	5.31
						(29.5)	(4.74)

x	17.8	26.7	50.2	41.8	33.5	30.9	28.1	26.9
y	3.65	4.79	9.18	6.31	4.69	4.38	4.03	5.31
Rank x	1	2	8	7	6	5	4	3
Rank y	1	5	8	7	4	3	2	6
d _i	0	3	0	0	2	2	2	3
d _i ²	0	9	0	0	4	4	4	9
Ed _i ²	= 30							

$$SRCC = 1 - \frac{6 \times 30}{8(8^2 - 1)} = 1 - \frac{180}{504}$$

$$= 1 - 0.3571$$

$$= 0.6429 \rightarrow +ve \text{ relationship.}$$

=====

42. TESCO PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1977	1.5582	52.5	32	42.3	4.49	34.7	9.42
1978	1.7136	57.5	38	47.8	5.38	31.9	8.88
1979	2.0181	83	51	67	11.5	17.5	5.83
1980	2.45	75.5	49	62.3	10.6	23.1	5.88
1981	2.55	71.5	47	59.3	9.0	28.3	6.59
1982	3.0	138	49.5	93.8	9.2	32.6	10.2
1983	3.5	181	108	144.5	12.57	27.8	11.49
1984	4.1	239	155	197	12.67	32.4	15.55
						(30.1)	(9.15)

x	34.7	31.9	17.5	23.1	28.3	32.6	27.8	32.4
y	9.42	8.88	5.83	5.88	6.59	10.2	11.49	15.55
Rank x	8	5	1	2	4	7	3	6
Rank y	5	4	1	2	3	6	7	8
d _i	3	1	0	0	1	1	4	2
d _i ²	9	1	0	0	1	1	16	4
E _{d_i} ²	= 32							

$$SRCC = 1 - \frac{6 \times 32}{8(8^2 - 1)} = 1 - \frac{192}{504}$$

$$= 1 - 0.38095$$

$$= 0.61905 \longrightarrow + \text{ve relationship.}$$

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43. TRAFALGAR HOUSE PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	3.17	116.5	64	90.25	9.6	33.0	9.40
1977	3.49	164	93	128.5	12.4	28.1	10.36
1978	3.84	113.6	73.3	93.5	16.1	23.9	5.81
1979	4.61	87	48.5	67.8	11.4	40.4	5.95
1980	5.35	85	48.5	66.8	12.7	42.1	5.26
1981	6.2	85	54	69.5	20.4	30.4	3.41
1982	7.2	110	74.5	92.3	20.6	34.9	4.48
1983	8.5	151	95	123	24.6	34.6	5.0
						(33.8)	(5.54)

x	33.0	28.1	23.9	40.4	42.1	30.4	34.9	34.6
y	9.40	10.36	5.81	5.95	5.26	3.41	4.48	5.0
Rank x	4	2	1	7	8	3	6	5
Rank y	7	8	5	6	4	1	2	3
d _i	3	6	4	1	4	2	4	2
d _i ²	9	36	16	1	16	4	16	4
Edi ²	= 102							

$$SRCC = 1 - \frac{6 \times 102}{8(8^2 - 1)} = 1 - \frac{612}{504}$$

$$= 1 - 1.21429$$

= - 0.21429 → - ve relationship (significant at 5% confidence level)

44. TRAFFORD PARK ESTATES PLC.

YEAR	DPS (pence)	SHARE PRICE (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1979	4.96183	161	108	134.5	8.88	55.9	15.15
1980	6.0	159	110	134.5	8.27	72.6	16.26
1981	7.25	186	115	150.5	10.55	68.7	14.27
1982	8.25	142	126	134	13.66	60.4	9.81
1983	9.25	147	116	131.5	14.88	62.2	8.84
1984	10.0	189	148	168.5	13.17	75.9	12.79
						(65.4)	(13.53)

x	55.9	72.6	68.7	60.4	62.2	75.9
y	15.15	16.26	14.27	9.81	8.84	12.79
Rank x	1	5	4	2	3	6
Rank y	5	6	4	2	1	3
d _i	4	1	0	0	2	3
d _i ²	16	1	0	0	4	9
Ed _i ²	= 30					

$$SRCC = 1 - \frac{6 \times 30}{6(6^2 - 1)} = 1 - \frac{180}{210}$$

$$= 1 - 0.8571$$

$$= 0.1429 \rightarrow 0 \text{ no relationship.}$$

=====

45. TRAVIS & ARNOLD PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	1.74	135	63	99	15.3.	11.4	6.47
1977	1.91	149	82	115.5	11.7	16.3	9.87
1978	2.15	194	127.5	160.8	16.1	13.4	9.99
1979	7.16	258	163	210.5	24.6	29.1	8.56
1980	3.94	138	100	119	39.7	9.9	2.99
1981	4.33	194	97	145.5	19.7	21.9	7.39
1982	5.46	290	160	225	28.5	19.2	7.89
1983	6.825	360	278	319	33.2	20.6	9.61
						(17.8)	(8.23)

x	11.4	16.3	13.4	29.1	9.9	21.9	19.2	20.6
y	6.47	9.87	9.99	8.56	2.99	7.39	7.89	9.61
Rank x	2	4	3	8	1	7	5	6
Rank y	2	7	8	5	1	3	4	6
di	0	3	5	3	0	4	1	0
di ²	0	9	25	9	0	16	1	
$\sum di^2 = 60$								

$$SRCC = 1 - \frac{6 \times 60}{8(8^2 - 1)} = 1 - \frac{360}{504}$$

$$= 1 - 0.71429$$

$$= 0.28571 \rightarrow +ve \text{ relationship.}$$

=====

46. TURNER & NEWALL PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	9.12	176	108	142	19.75	46.2	7.19
1977	10.17	253	127	190	30.89	32.9	6.15
1978	11.2	244	155	199.5	17.05	65.7	11.7
1979	11.5	178	107	142.5	6.29	182.8	22.66
1980	6.0	145	20	85.2	- 8.21	-	-
1981	3.0	121	67	94.0	- 5.52	-	-
1982	0.25	110	18	64.0	- 28.77	-	-
1983	1.0	77	23	50.0	4.85	20.6	10.31
						(46.2)	(10.31)

x	46.2	32.9	65.7	182.8	20.6
y	7.19	6.15	11.7	22.66	10.31
Rank x	3	2	4	5	1
Rank y	2	1	4	5	3
d _i	1	1	0	0	2
d _i ²	1	1	0	0	4
Σd _i ²	= 6				

$$SRCC = 1 - \frac{6 \times 6}{5(5^2 - 1)} = 1 - \frac{36}{120}$$

$$= 1 - 0.3$$

$$= 0.7 \rightarrow +ve \text{ relationship.}$$

47. UNITED BISCUITS (HOLDINGS) PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1978	2.915	96	69	82.5	13.7	21.3	6.02
1979	3.7	96	73	84.5	13.9	26.6	6.08
1980	4.37	94	65	79.5	12.1	36.1	6.57
1981	5.25	139	76	107.5	14.1	37.2	7.62
1982	5.8	149	104	126.5	14.8	39.2	8.55
1983	7.0	162	125	143.5	18.3	38.3	7.84
						(36.6)	(7.09)

x 21.3 26.6 36.1 37.2 39.2 38.3

y 6.02 6.08 6.57 7.62 8.55 7.84

Rank x 1 2 3 4 6 5

Rank y 1 2 3 4 6 5

$E d_i^2 = 0$

SRCC = 1 perfect + ve relationship.

48. WHITECROFT PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EFS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1978	13.4	115	87.63	101.3	14.70	13.2	6.89
1979	7.7	149	78	113.5	16.00	48.1	7.09
1980	7.7	88	43	65.5	12.68	60.7	5.17
1981	3.85	72	38	55	7.58	50.8	7.26
1982	4.5	101	56	78.5	11.83	38.0	6.64
1983	5.4	175	86	130.5	18.49	29.2	7.06
1984	6.6	173	144	158.5	22.60	29.2	7.01
						(38.0)	(7.01)

x	13.2	48.1	60.7	50.8	38.0	29.2	29.2
y	6.89	7.09	5.17	7.26	6.64	7.06	7.01
Rank x	1	5	7	6	4	2.5	2.5
Rank y	3	6	1	7	2	5	4
d _i	2	1	6	1	2	1.5	1.5
d _i ²	4	1	36	1	4	2.25	2.25
$\sum d_i^2$	= 50.5						

$$SRCC = 1 - \frac{6 \times 50.5}{7(7^2 - 1)} = 1 - \frac{303}{336}$$

$$= 1 - 0.90179$$

$$= 0.09821 \rightarrow 0 \quad \text{no relationship}$$

=====

49. WILLIS FABER PLC.

YEAR	DPS (pence)	SHARE PRICES (pence)			EPS (pence)	PR(%) x	PE y
		Highest	Lowest	Average			
1976	7.65	215	182	198.5	18.83	40.6	10.54
1977	9.04	318	190	254	21.85	41.4	11.62
1978	9.76	305	223	264	21.68	45.0	12.18
1979	11.0	280	187	233.5	20.30	54.2	11.50
1980	12.0	290	215	252.5	23.90	50.2	10.56
1981	15.0	407	260	333.5	32.31	46.4	10.31
1982	17.5	548	360	454	37.86	46.2	11.99
1983	21.0	697	495	596	47.12	44.6	12.65
						(45.6)	(11.56)

x	40.6	41.4	45.0	54.2	50.2	46.4	46.2	44.6
y	10.54	11.62	12.18	11.50	10.56	10.31	11.99	12.65
Rank x	1	2	4	8	7	6	5	3
Rank y	2	5	7	4	3	1	6	8
d _i	1	3	3	4	4	5	1	5
d _i ²	1	9	9	16	16	25	1	25
E d _i ²	= 102							

$$SRCC = 1 - \frac{6 \times 102}{8(8^2 - 1)} = 1 - \frac{612}{504}$$

$$= 1 - 1.2143$$

$$= -0.2143 \rightarrow \text{-ve relationship significant at 5\%}$$

=====

50. GEORGE WIMPEY PLC.

SHARE PRICES
(pence)

YEAR	DPS (pence)	Highest	Lowest	Average	EPS (pence)	PR(%) x	PE y
1979	2.25	103.5	65	84.25	14.5	15.5	5.81
1980	2.25	97	62	79.5	15.4	14.6	5.45
1981	2.8	131	77	104	17.8	15.7	6.62
1982	3.0	134	92	113	13.7	21.9	5.16
1983	3.05	148.2	101.8	125	13.2	23.1	5.41
						(15.7)	(5.45)

x	15.5	14.6	15.7	21.9	23.1
y	5.81	5.45	6.62	5.16	5.41
Rank x	2	1	3	4	5
Rank y	4	3	5	1	2
d _i	2	2	2	3	3
d _i ²	4	4	4	9	9
Ed _i ²	= 30				

$$SRCC = 1 - \frac{6 \times 30}{5(5^2 - 1)} = 1 - \frac{180}{120}$$

$$= 1 - 1.5$$

$$= -0.5 \longrightarrow \text{- ve relationship.}$$

=====

Appendix B : Computation of annual SRCC indexes.

1979		1980		1981		1982		1983		1984		
PR	PE	PR	PE	PR	PE	PR	PE	PR	PE	PR	PE	
131.6	43.68	20.1	6.31	19.5	7.05	18.4	6.56	19.0	5.93	22.4	7.75	
29.13	4.1	75.9	29.04	65.6	23.73	57.7	24.52	6.88	18.9	8.92	15.58	
18.3	3.36	100	17.04	50	7.6	28.8	12.6	31.6	6.17	39.1	8.22	
41.9	11.48	18.6	2.7	39.3	5.95	43.7	16.91	39.8	15.7	44.8	14.83	
42.5	10.83	49.8	11.67	4	.3	14.11	38.8	19.99	40.4	17.6	44.4	14.45
46.9	15.0	71.1	11.29	51.6	18.36	66.4	19.02	68.8	10.83	60.6	19.51	
29.1	7.19	52.2	15.41	49.3	16.78	50.9	10.86	46.6	10.34	34.3	11.88	
31.49	7.88	39.6	10.11	45.9	11.05	28.2	8.58	20.6	17.86	36.5	13.96	
32.5	10.25	33.4	8.69	29.03	6.43	36.5	13.54	39.8	16.36	36.92	9.5	
36.89	5.75	58.3	9.57	33.3	11.15	44.7	9.9	43.9	9.28	38.36	14.7	
27.59	6.92	37.2	5.88	40.9	7.86	81.58	16.99	49.42	12.99	64.14	14.27	
23.03	5.92	109.8	18.93	130.1	21.22	25.88	10.94	14.58	7.65	48.48	9.02	
36.22	7.52	24.79	6.17	24.09	7.83	62.82	10.41	80.33	18.07	40.92	11.05	
54.1	14.09	38.01	9.16	36.89	7.21	31.03	9.75	33.47	10.79	16.78	13.26	
34.09	5.36	38.56	7.08	32.53	8.08	102.94	14.29	53.24	7.78	28.38	19.65	
22.16	8.55	44.87	5.38	20.43	2.53	62.55	16.8	48.96	12.47	29.9	13.77	
33.17	3.72	32.84	11.9	27.13	9.02	60.81	8.32	27.71	4.06	38.4	11.83	
14.45	5.52	52.79	7.94	20.53	8.93	18.62	10.25	17.18	9.08	30.6	8.01	
149.5	47.24	17.88	6.21	62.85	19.16	59.83	41.32	28.57	27.02	32.1	13.24	
27.12	6.9	77.24	18.29	28.43	7.37	30.69	9.01	28.83	9.93	48.3	12.42	
24.84	6.55	29.19	6.33	23.19	7.32	25.19	8.46	25.58	7.85	35.5	15.23	
30.8	4.93	23.29	6.05	140.4	24.39	96.2	19.28	108.1	13.26	49.6	9.29	
81.7	24.19	68.4	10.16	58.8	8.61	78.5	13.02	42.6	8.93	48.1	9.99	
31.9	6.83	76.9	16.36	59.3	11.81	150	24.01	137.5	22.92	29.1	10.42	

YEAR :1979

x	131.6	29.13	18.3	41.9	42.5	46.9	29.1	31.49	32.5	36.89	27.89	23.03
y	43.68	4.1	3.36	11.48	10.83	15.0	7.19	7.88	10.25	5.75	6.92	5.92
Rank x	46	18	7	34	35	37	16.5	20	22	30	15	10
Rank y	46	3	1	35	34	41	23	27	33	10	21	13
di ₂	0	15	6	1	1	4	6.5	7	11	20	6	3
di ²	0	225	36	1	1	16	42.25	49	121	400	36	9
x	36.22	54.1	34.09	22.16	33.17	14.45	149.5	27.12	24.84	30.8	81.7	31.9
y	7.52	14.09	5.36	8.55	3.72	5.52	47.24	6.9	6.55	4.93	24.19	6.83
Rank x	28	40	27	9	25	3	47	13	11	19	44	21
Rank y	25.5	40	7	29	2	8	47	20	18	6	44	19
di ₂	2.5	0	20	20	20	5	0	7	7	13	0	2
di ²	6.25	0	400	400	400	25	0	49	49	169	0	4
x	16.8	13.9	33.8	20.3	27.5	33.0	65.7	43.2	32.7	40.1	49.6	89.4
y	12.39	4.54	5.56	4.67	9.27	21.53	7.95	11.52	9.5	7.52	6.5	36.04
Rank x	5	2	26	8	14	24	43	36	23	31	39	45
Rank y	39	4	9	5	31	43	28	37	32	25.5	17	45
di ₂	34	2	17	3	17	19	15	1	9	5.5	22	0
di ²	1156	4	289	9	289	361	225	1	81	30.25	484	0
x	13.5	36.8	41.8	17.5	40.4	55.9	29.1	26.6	48.1	54.2	15.5	
y	7.21	11.88	6.31	5.83	5.95	15.15	8.56	6.08	7.09	11.5	5.81	
Rank x	1	29	33	6	32	42	16.5	12	38	41	4	
Rank y	24	38	16	12	14	42	30	15	22	36	11	
di ₂	23	9	17	6	18	0	13.5	3	16	5	7	
di ²	529	81	289	36	324	0	182.25	9	256	25	49	

$$\begin{aligned} \Sigma di^2 &= 7128 \\ SRCC &= 1 - \frac{6 \times 7128}{47(47^2 - 1)} = 1 - \frac{42768}{103,776} \\ &= 1 - 0.41212 \\ &= 0.5879 \longrightarrow +ve \text{ relationship.} \\ &===== \end{aligned}$$

YEAR : 1980

x	20.1	75.9	100	18.6	49.8	71.1	52.2	39.6	33.4	58.3	37.2	108.89	24.79
y	6.31	29.04	17.04	2.7	11.67	11.29	15.41	10.11	8.69	9.57	5.88	18.93	6.17
Rank x	5	43	47.5	4	33	41	36	24	16	38	21	49	9
Rank y	14	49	45	1	37	35	40	30	24	29	9.5	47	12
di ₂	9	6	2.5	3	4	6	4	6	8	9	11.5	2	3
di	81	36	6.25	9	16	36	16	36	64	81	132.25	4	9

x	38.01	38.56	44.8	32.84	52.79	17.88	77.24	29.19	23.29	68.4	76.9	42.1	35.7
y	9.16	7.08	5.38	11.9	7.94	6.21	18.29	6.33	6.09	10.16	16.36	9.39	10.24
Rank x	22	23	31	15	37	3	45	12	8	40	44	27.5	18
Rank y	27	19	6	38	22	13	46	15	11	31	42	26	32
di ₂	5	4	25	23	15	10	1	3	3	9	2	1.5	14
di	25	16	625	529	225	100	1	9	9	81	4	2.25	196

x	29.7	36.6	31.6	40.4	27.8	47.2	100	43	44.6	41.6	51.3	97.2	25.9
y	16.42	8.52	5.6	7.91	7.10	13.66	9.54	10.68	16.63	11.65	6.48	24.03	9.07
Rank x	13	20	14	25	11	32	47.5	29	30	26	35	46	10
Rank y	43	23	8	21	20	39	28	34	44	36	16	48	25
di ₂	20	3	6	4	9	7	19.5	5	14	10	19	2	15
di	400	9	36	16	81	49	380.25	25	196	100	361	4	225

x	22.2	33.5	23.1	42.1	72.6	9.9	36.1	60.7	50.2	14.6
y	6.81	4.69	5.88	5.26	16.26	2.99	6.57	5.17	10.56	5.45
Rank x	6	17	7	27.5	42	1	19	39	34	2
Rank y	18	3	9.5	5	41	2	17	4	33	7
di ₂	12	14	2.5	22.5	1	1	2	35	1	5
di	144	196	6.25	506.25	1	1	4	1225	1	25

$$\sum di^2 = 6340.5$$

$$SRCC = 1 - \frac{6 \times 6340.5}{49(49^2 - 1)} = 1 - \frac{38043}{117600}$$

$$= 1 - 0.32349$$

$$= 0.67651 \longrightarrow +ve \text{ relationship}$$

YEAR : 1981

x	19.5	65.6	50	39.3	49.3	51.6	49.3	45.9	29.03	33.3	40.9	130.1
y	7.05	23.73	7.6	5.95	14.11	18.36	16.78	11.05	6.43	11.15	7.86	21.22
Rank x	3	44	36	27	34.5	38	34.5	31	13	17	28	46
Rank y	11	45	17	7	36	41	40	30	8	32	21	43
di ₂	8	1	19	20	1.5	3	5.5	1	5	15	7	3
di ²	64	1	361	400	2.25	9	30.25	1	25	225	49	9
x	24.09	36.89	32.53	20.43	27.13	20.53	62.85	28.43	23.19	140.4	58.8	59.3
y	7.83	7.21	8.08	2.53	9.02	8.93	19.16	7.37	7.32	24.39	8.61	11.81
Rank x	8	23	16	4	10	5	41	12	7	47	39	40
Rank y	20	12	22	1	25	24	42	15	14	46	23	33
di ₂	12	11	6	3	15	19	1	3	7	1	16	7
di ²	144	121	36	9	225	361	1	9	49	1	256	49
x	40.2	37.9	13.4	34.9	44.7	62.9	35.4	33.9	24.5	33.9	34.4	64.6
y	9.69	22.37	3.33	7.65	9.73	16.08	3.85	10.88	11.1	14.45	5.30	28.55
Rank x	30	26	1	21	29	42	22	18.5	9	18.5	20	43
Rank y	26	44	2	19	27	39	5	29	31	38	6	47
di ₂	4	18	1	2	2	3	17	10.5	22	19.5	14	4
di ²	16	324	1	4	4	9	289	110.25	484	380.25	196	16
x	37.4	48.1	30.9	28.3	30.4	68.7	21.9	37.2	50.8	46.4	15.7	
y	12.97	14.09	4.38	6.59	3.41	14.27	7.39	7.62	7.26	10.31	6.62	
Rank x	25	33	15	11	14	45	6	24	37	32	2	
Rank y	34	35	3	9	4	37	16	18	13	28	10	
di ₂	9	2	12	2	10	8	10	6	24	4	8	
di ²	81	4	144	4	100	64	100	36	576	16	64	

$$\Sigma di^2 = 5460$$

$$SRCC = 1 - \frac{6 \times 5460}{47(47^2 - 1)} = 1 - \frac{32760}{103,776}$$

$$= 1 - 0.315679 = 0.6843 \rightarrow + \text{relationship.}$$

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YEAR : 1982

x	18.4	57.7	28.8	43.7	38.8	66.4	50.9	28.2	36.5	44.7	81.58	25.88
y	6.56	24.52	12.6	16.91	19.99	19.02	10.86	8.58	13.54	9.9	16.99	10.94
Rank x	1	35	12	28	22	41	34	10	19	29	43	6
Rank y	7	44	27	35	42	39	23	13	29	17	36	24
di	6	9	15	7	20	2	11	3	10	12	7	18
di ²	36	81	225	49	400	4	121	9	100	144	49	324
x	62.82	31.03	102.94	62.55	60.81	18.62	59.83	30.69	25.19	39.2	96.2	78.5
y	10.41	9.75	14.29	16.8	8.32	10.25	41.32	9.01	8.46	8.55	19.28	13.02
Rank x	40	15	45	39	38	2	36	14	5	23	44	42
Rank y	21.5	15	31	34	10	19	46	14	11	12	40	28
di	18.5	0	14	5	28	17	10	0	6	11	4	14
di ²	342.2	0	196	25	784	289	100	0	36	121	16	196
x	150	37.6	41.9	27.5	45.8	49.9	43.5	35.4	19.2	27.6	29.4	42.9
y	24.01	10.4	15.08	6.45	26.64	19.58	5.0	10.41	7.89	13.98	17.02	6.47
Rank x	46	20	25	7	30	33	27	18	3	8	13	26
Rank y	43	20	32	5	45	41	3	21.5	9	30	37	6
di	3	0	7	2	15	8	24	3.5	6	22	24	20
di ²	9	0	49	4	225	64	576	12.25	36	484	576	400
x	48.4	28.5	40.4	28.1	32.6	34.9	60.4	38.0	46.2	21.9		
y	17.48	15.2	12.15	4.03	10.2	4.48	9.81	6.64	11.99	5.16		
Rank x	32	11	24	9	16	17	37	21	31	4		
Rank y	38	33	26	1	18	2	16	8	25	4		
di	6	22	2	8	2	15	21	13	6	0		
di ²	36	484	4	64	4	225	441	169	36	0		

$$\begin{aligned} \Sigma di^2 &= 7545.5 \\ SRCC &= 1 - \frac{6 \times 7545.5}{46(46^2 - 1)} = 1 - \frac{45,273}{97,290} \\ &= 1 - 0.46534 = 0.5347 \longrightarrow + \text{ve relationship.} \\ & \quad \text{=====} \end{aligned}$$

YEAR : 1983

x	19.0	6.88	31.6	39.8	40.4	68.8	46.6	20.6	39.8	43.9	49.42	14.58
y	5.93	18.9	6.17	15.7	17.6	10.83	10.34	17.86	16.36	9.28	12.99	7.65
Rank x	5	1	20	30.5	32	44	38	7	30.5	36	40	2
Rank y	7	44	9	38	40	26	24	42	39	20	33	13
di ₂	2	43	11	7.5	8	18	14	35	8.5	16	7	11
di ²	4	1849	121	56.25	64	324	196	1225	72.25	256	49	121
x	80.33	33.47	53.24	48.96	27.71	17.18	28.57	28.83	25.58	108.1	42.6	137.5
y	18.07	10.79	7.78	12.47	4.06	9.08	27.02	9.93	7.85	13.26	8.93	22.92
Rank x	45	21	42	39	15	3	17	18	12	46	34	47
Rank y	43	25	14	31	1	19	47	22	16	34	17	46
di ₂	2	4	28	8	14	16	30	4	4	12	17	1
di ²	4	16	786	64	196	256	900	16	16	144	289	1
x	36.7	41.1	18.8	24.2	38.9	49.5	36.7	36.3	25.9	36.5	25.2	34.7
y	12.1	13.42	4.51	7.18	15.4	20.15	4.73	11.17	11.38	5.94	17.72	7.51
Rank x	26.5	33	4	10	29	41	26.5	24	13	25	11	23
Rank y	30	35	2	11	37	45	3	27	28	8	41	12
di ₂	3.5	2	2	1	8	4	23.5	3	15	17	30	11
di ²	12.25	4	4	1	64	16	552.25	9	225	289	900	121
x	43.8	26.9	27.8	34.6	62.2	20.6	20.6	38.3	29.2	44.6	23.1	
y	14.38	5.31	11.49	5.0	8.84	9.61	10.31	7.84	7.06	12.65	5.41	
Rank x	35	14	16	22	43	7	7	28	19	37	9	
Rank y	36	5	29	4	18	21	23	15	10	32	6	
di ₂	1	9	13	18	25	14	16	13	9	5	3	
di ²	1	81	169	324	625	196	256	169	81	25	9	

$$\begin{aligned}
 \sum di^2 &= 11,159 \\
 SRCC &= \frac{1}{1} - \frac{6 \times 11,159}{47(47^2 - 1)} = 1 - \frac{66,954}{103776} \\
 &= 1 - 0.645178 = \underline{\underline{0.354822}} \rightarrow +ve \text{ relationship.}
 \end{aligned}$$

YEAR : 1984

x	22.4	8.92	39.1	44.8	44.4	60.6	34.3	36.5	36.92	38.36
y	7.75	15.58	8.22	14.83	14.45	19.51	11.88	13.96	9.5	14.7
Rank x	3	1	19	23	22	28	12	14	15	16
Rank y	3	28	5	25	23	29	15	21	8	24
di ₂	0	27	14	2	1	1	3	7	7	8
di ²	0	729	196	4	1	1	9	49	49	64

x	64.14	48.48	40.92	16.78	28.38	29.9	38.4	30.6	32.1	48.3
y	14.27	9.02	11.05	13.26	19.65	13.77	11.83	8.01	13.24	12.42
Rank x	29	26	20	2	5	8	17.5	9	10	25
Rank y	22	6	12	19	30	20	14	4	18	16
di ₂	7	20	8	17	25	12	3.5	5	8	9
di ²	49	400	64	289	625	144	12.25	25	64	81

x	35.5	49.6	48.1	29.1	38.4	43.2	26.9	32.4	75.9	29.2
y	15.23	9.29	9.99	10.42	10.08	11.81	5.31	15.55	12.79	7.01
Rank x	13	27	24	6	17.5	21	4	11	30	
Rank y	26	7	9	11	10	13	1	27	17	
di ₂	13	20	15	5	7.5	8	3	16	13	
di ²	169	400	225	25	56.25	64	9	256	169	

$$\begin{aligned} \sum di^2 &= 4253.5 \\ SRCC &= 1 - \frac{6 \times 4253.5}{30(30^2 - 1)} \\ &= 1 - \frac{25521}{26970} \\ &= 1 - 0.94627 \\ &= \underline{\underline{0.05373}} \longrightarrow \text{no relationship.} \end{aligned}$$

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